POLARAD

# HANDBOOK OF OPERATING AND MAINTENANCE INSTRUCTIONS

## MICROWAVE SPECTRUM ANALYZERS MODELS TSA-W AND TSA-WF

POLARAD ELECTRONIC INSTRUMENTS,
DIVISION OF POLARAD ELECTRONICS CORPORATION
34-02 QUEENS BLVD., LONG ISLAND CITY 1, N. Y.

POLARAD

# INSTRUCTION MANUAL

## MICROWAVE
## SPECTRUM ANALYZERS
## MODELS
## TSA-W AND TSA-WF

THIS HANDBOOK COVERS EQUIPMENT
PREFIXED WITH SERIAL NO. 5-1 & UP

P O L A R A D
ELECTRONIC INSTRUMENTS

DIVISION OF POLARAD ELECTRONICS CORPORATION

43-20 34TH STREET, LONG ISLAND CITY 1, N. Y.

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# Warranty

Polarad Electronics Corporation warrants each instrument of its manufacture to be free from defects in material and workmanship. Our obligation under this Warranty is limited to servicing or adjusting any instrument returned to our factory for that purpose, and to making good at our factory any part or parts thereof except tubes, fuses or batteries, which shall, within one year after making delivery to the original purchaser, be returned to us with transportation charges prepaid, and which on our examination shall disclose to our satisfaction to have been thus defective.

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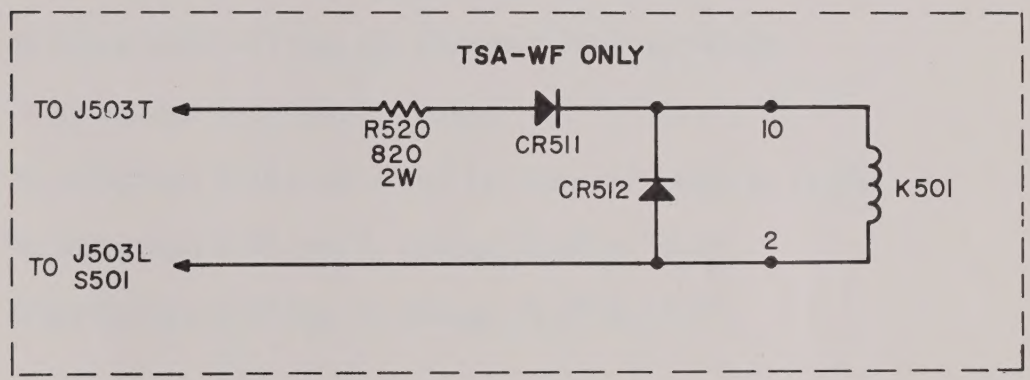
## ADDENDUM

Add the following paragraph to page 2-4, paragraph 2-8 sub-paragraph "h", and to page 2-6, table 2-1, index number 27:

> When utilizing tuning unit Model STU-1BW, the maximum useful dispersion is 25 mc for the range covering 55 mc to 1000 mc and 5 mc of maximum useful dispersion for the range covering 10 mc to 55 mc.

Add the following sub-chassis to figure 5-2 (the video schematic diagram) on pages 5-5/5-6:




## NOTICE

When ordering replacement parts or requesting any information regarding the tuning units, refer to Models STU-1WA through STU-5WA as STU-1B, STU-2BW through STU-5BW, respectively.

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# ADDENDA

In paragraph 3-16 line 2, change "5-2" to "5-1".

In paragraph 3-17 line 12, change "V702" to "V703".

In paragraph 3-18 line 2, change "5-2" to "5-1".

In paragraph 3-19 lines 9 and 17, change "L402" to "L403".

In paragraph 3-23 line 2, change "5-2" to "5-1".

In paragraph 3-28 line 3, change "5-2" to "5-1".

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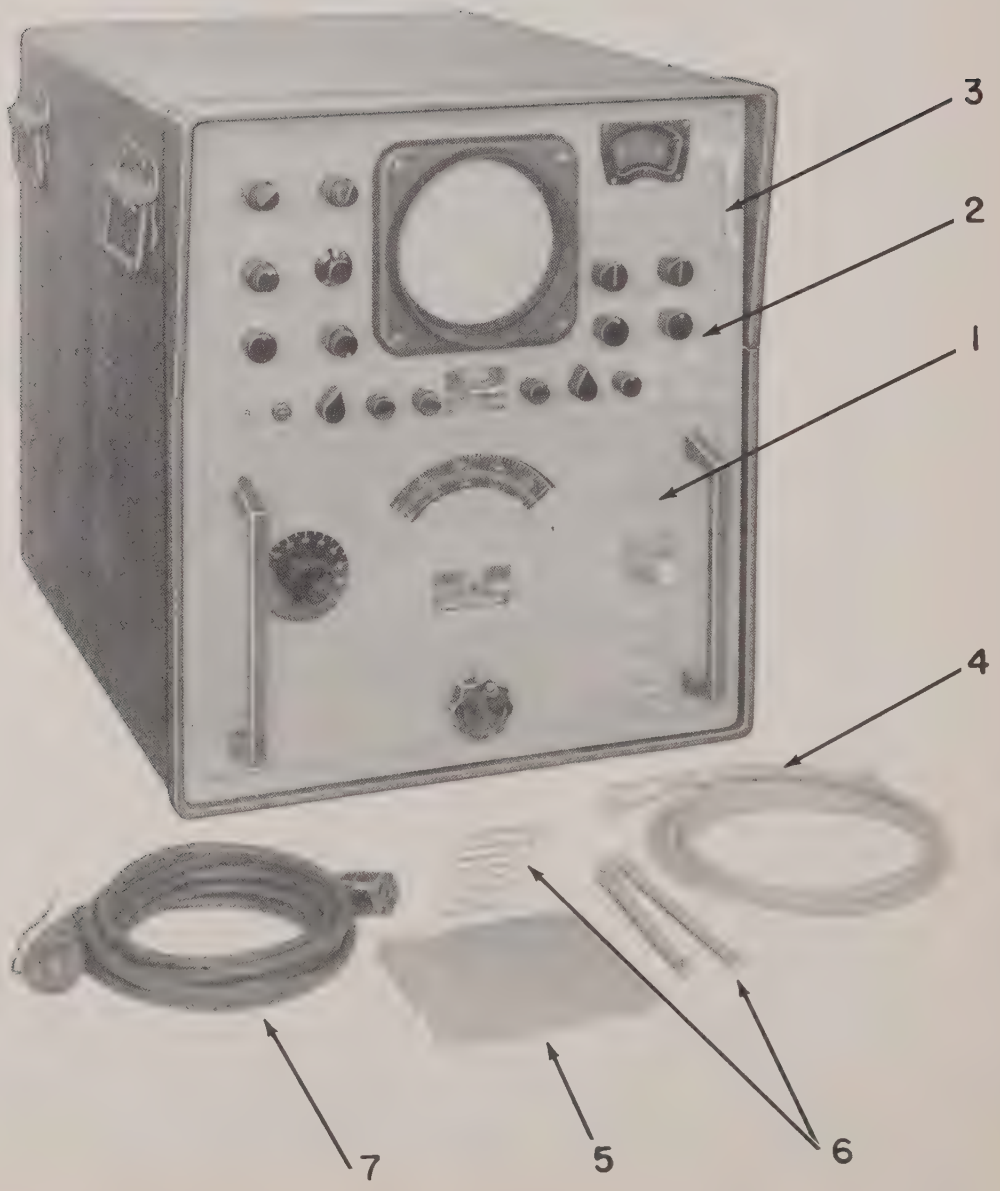



Figure 1-1. Model TSA-W Spectrum Analyzer and Accessories

# SECTION I

# INTRODUCTION

## 1-1. SCOPE OF MANUAL.

1-2. This manual contains instructions for the installation, operation and maintenance of the Polarad Wide Dispersion Spectrum Analyzer, Models TSA-W and TSA-WF. The Models TSA-W and TSA-WF are identical except that the Model TSA-WF is designed to operate at a power line frequency between 50 and 1,000 cps. The Model TSA-W is described in this manual and this information also applies to the TSA-WF unless otherwise noted. The Models TSA-W and TSA-WF are designed and manufactured by Polarad Electronics Corporation, Long Island City 1, New York.

## 1-3. PURPOSE OF EQUIPMENT.

1-4. The Polarad Wide Dispersion Spectrum Analyzer, Model TSA-W, is a precision instrument for presenting the spectral display of signal energy in the frequency range from 10 to 44,000 mc. The spectral display appears on the screen of a cathode-ray tube with the frequency of the applied signal being displayed on the X axis, while the amplitude of the frequency is displayed on the Y axis. Some specific uses of the Model TSA-W are:

a. Observing and measuring AM and FM signal side bands.

b. Measuring the frequency of radio and/or radar signals.

c. Determining the type of modulation in radio and/or radar signals.

d. Checking the tracking of radar system r-f components.

e. Displaying the power spectrum of r-f pulses.

f. Checking the spectrum of pulsed magnetron oscillators.

g. Measuring noise spectra.

h. Measuring frequency.

i. Checking frequency relationship of multi-frequency transmitters.

j. Measuring parasitic oscillation.

k. Checking transmitters or signal generators for continuous output throughout the tuning range.

l. Checking oscillator frequency drift.

m. Locating the sources of r-f leaks.

## 1-5. GENERAL DESCRIPTION.

1-6. The Model TSA-W is essentially a superheterodyne receiver using four converters and working into a cathode-ray tube display. It consists of the basic unit Model DU-2A and one of the five plug-in RF Tuning Units, Models STU-1WA, STU-2WA, STU-3WA, STU-4WA and STU-5WA. The tuning units cover a frequency range from 10 to 44,000 mc. The basic unit consists of a wide band i-f amplifier, narrow band i-f amplifier, variable bandwidth i-f amplifier, variable frequency marker oscillator, sweep frequency generator, and video chassis. The video chassis contains a logarithmic amplifier, vertical and horizontal amplifiers, blanking and intensifier amplifier, and the phantastron sweep generator. Four electronically regulated power supplies and one unregulated supply provide the necessary operating voltages. Each of the five tuning units contains a local oscillator, a crystal mixer, and a precision UNIDIAL® drive mechanism for simultaneous tracking of the local oscillator with tuning dial rotation. Special shielding is provided to minimize leakage radiation and to permit satisfactory operation in the presence of high power transmitters. The Model TSA-W is furnished either in a cabinet for bench or cart use, or with brackets for rack mounting.

## 1-7. EQUIPMENT SUPPLIED.

1-8. Table 1-1 lists the equipment which comprises the Model TSA-W. Optional accessories are listed in table 1-2.

TABLE 1-1. EQUIPMENT SUPPLIED

| Figure 1-1 Index No. | Component | Polarad Model or Part No. | Over-all Dimensions (inches) (Unless otherwise indicated) | Weight (lbs.) |
|---|---|---|---|---|
| 1 | RF Tuning Unit | STU-1WA, STU-2WA, STU-3WA, STU-4WA, or STU-5WA | HxWxD | |
| 2 | Model TSA-W Basic Unit | DU-2A | 20-1/2 x 18-3/4 x 25-3/4 | 135 |
| 3 | I-F Cable Assembly W80 | A135336 | 4 in. long | |
| 4 | AC Power Cord W71 with Adapter CP1 | B111144, A131966 | 10 ft. long | 1.06 |
| 5 | Amber CRT Filter H1 | B27336-1 | | 0.25 |
| 6 | Wrench Kit | A25109 | | 0.75 |
| 7 | R-F Cable Assembly W72 | BP12551 | 6 ft. long | 0.75 |
| | Plastic Bag | | 16 x 12-1/2 | |
| | Instruction Manual | | | |
| | Handbook of Spectrum Analyzer Techniques | | | |

TABLE 1-2. OPTIONAL ACCESSORIES

| Name | Function |
|---|---|
| RF Tuning Units Models STU-1WA, STU-2WA, STU-3WA, STU-4WA, and STU-5WA. | Additional tuning units increase the frequency range of the basic TSA-W Spectrum Analyzer |
| RF Tuning Unit Dust Cover. | Used to store tuning units when they are not installed in basic unit Model DU-2A |
| Model DA-4 Instrument Dolly. | Conserves bench space and makes cabinet mounted unit more portable. |
| Model SB-2 Brackets. | For rack mounting unit with panel flush with rack. |
| Model SB-3 Brackets. | For rack mounting unit with panel protruding from rack. |

## 1-9. TECHNICAL CHARACTERISTICS.

1-10. The technical characteristics of the Model TSA-W are listed below. Unless otherwise stated all values are nominal.

DISPLAY AND POWER SUPPLY UNIT MODEL DU-2A:

| | |
|---|---|
| Shielding attenuation | Greater than 100 db. |
| Spectral display | Signal amplitude on vertical axis (log or linear), versus frequency on horizontal axis. |
| Logarithmic display | 3 db per graticule division to 24 db. |
| Variable bandwidth | 1 kc to 80 kc, continuously variable. |
| Sweep Frequency Rate | 1 to 30 cps, adjustable. |
| Frequency dispersion: | |
| Below 55 mc | 60 kc to 5 mc. |
| 55 mc to 1,000 mc | 60 kc to 25 mc. |
| 1,000 to 44,000 mc | 60 kc to 80 mc in two bands: 60 kc to 10 mc and 1 mc to 80 mc. |
| I-F Attenuation range | 0 to 40 db, continuously variable. |
| Internal marker | Variable marker calibration ±40 mc in frequency difference from 160 mc. Adjustable amplitude. |
| Synchronization | External, free-running or line frequency. |
| Maximum power input | 250 milliwatts. |
| Cathode-ray tube | 5 inch flat face with edge lighting on graticule and camera mounting facilities on bezel. |
| Power requirements | |
| Model TSA-W | 115/230 vac ±10% 50/60 cps, 500 watts |
| Model TSA-WF | 115/230 vac ±10% 50 cps to 1,000 cps, 500 watts. |

RF TUNING UNITS:

| Model | Frequency Range (mc) | Sensitivity* (-dbm) | RF Attenuator Range |
|---|---|---|---|
| STU-1WA | 10 to 400 | 90 to 100 | 0 to 100 db |
| | 350 to 1,000 | 90 to 95 | 0 to 100 db |
| STU-2WA | 910 to 2,200 | 85 to 95 | 0 to 100 db |
| | 1,980 to 4,560 | 75 to 87 | 0 to 100 db |
| STU-3WA | 4,370 to 11,000 | 77 to 90 | 0 to 100 db |
| | 8,900 to 22,000 | 65 to 85 | below 12 kmc |
| STU-4WA | 21,000 to 33,000 | 57 to 75 | external attenuator |
| STU-5WA | 33,000 to 44,000 | 50 to 65 | external attenuator |

*Sensitivity is signal + noise = twice noise at minimum dispersion and resolution

| | |
|---|---|
| Frequency dial accuracy | ±1% of dial readings except for Model STU-1WA which is ±1% of local oscillator frequency. |

## 1-11. ELECTRON TUBE, SEMICONDUCTOR, FUSE AND INDICATOR LAMP COMPLEMENTS.

1-12. Tables 1-3 through 1-8 list the electron tube, semiconductor, fuse and indicator lamp complements respectively.

TABLE 1-3. MODEL DU-2A DISPLAY CHASSIS, ELECTRON TUBE COMPLEMENT

| Quantity | Type No. |
|---|---|
| 5 | OA2 |
| 2 | 1Z2 |
| 1 | 5ADP7 |
| 2 | 5R4 |
| 1 | 6AG5 |
| 2 | 6AK5 |
| 2 | 6AN8 |
| 1 | 6AR6 |
| 1 | 6005 |
| 1 | 6AS6 |
| 2 | 6BE6 |
| 2 | 12AT7 |
| 3 | 12AU7 |
| 4 | 12AX7 |
| 2 | 807 |
| 1 | 5651 |
| 4 | 5718 |
| 1 | 5881 |
| 3 | 6080 |
| 4 | 6922 |
| 4 | 6AH6 |

TABLE 1-4. TUNING UNITS, ELECTRON TUBE COMPLEMENT

| Quantity | Type No. | Tuning Unit Model No. |
|---|---|---|
| 1 | 6AF4A | STU-1WA |
| 1 | ZV1009, 6BM6 or 5837 | STU-2WA |
| 1 | 6X4 | STU-2WA |
| 1 | 5721 | STU-3WA |
| 1 | 6X4 | STU-3WA |
| 1 | 5721 | STU-4WA |
| 1 | 6X4 | STU-4WA |
| 1 | 5721 | STU-5WA |
| 1 | 6X4 | STU-5WA |

TABLE 1-5. MODEL DU-2A DISPLAY CHASSIS, SEMICONDUCTOR COMPLEMENT

| Quantity | Polarad Drawing or Type No. |
|---|---|
| 2 | 1N69 |
| 1 | 1N82A |
| 7 | 1N198 |
| 2 | 40K |
| 1 | 2N277 |
| 1 | 1N2970A |
| 1 | 1N1341 |
| 1 | A27794 |
| 12 | B707117 |

TABLE 1-6. TUNING UNITS, SEMICONDUCTOR COMPLEMENT

| Quantity | Type No. | Tuning Unit Model No. |
|---|---|---|
| 1 | PADT30 | STU-1WA |
| 1 | 1N21C | STU-1WA |
| 1 | 1N21B or 1N23C | STU-2WA |
| 1 | 1N26 or 1N78 | STU-3WA |
| 1 | 1N26 | STU-4WA |
| 1 | 1N53 | STU-5WA |

TABLE 1-7. FUSE COMPLEMENT

| Quantity | Type | Rating |
|---|---|---|
| 1 | MDL-4 Bussmann | 4A, 250V |
| 1 | MS90078-26 | 2A, 250V |
| 2 | MDL-6.25 Bussmann | 6.25A |

TABLE 1-8. INDICATOR LAMP COMPLEMENT

| Quantity | Type No. | Use |
|---|---|---|
| 1 | 328 | Power Indicator |
| 4 | 47 | Scale Illuminators |

# SECTION II

# OPERATION

## 2-1. INSPECTION.

2-2. Before installing or operating the Model TSA-W inspect for possible damage incurred during shipment. Check that the equipment is complete as listed on the packing slip or check it against the tables of components in paragraph 1-7. After the equipment has been checked for completeness, inspect it as follows:

a. Examine exterior surface for dents or scratches.

b. Examine handles, latches, and fasteners for tightness and ease of operation.

c. Operate control knobs which should turn freely, index at panel markings and be tight on their shafts.

d. Examine dials and indicators for legibility.

e. Operate switches which should set readily.

f. Examine electron tubes for proper seating and for presence of shields and clamps.

## 2-3. EQUIPMENT INSTALLATION.

2-4. After inspecting the equipment plan its installation. The Model TSA-W is supplied mounted in a cabinet for bench or cart use or ready for one of two types of rack mountings.

a. Figure 2-1 illustrates the Model TSA-W installed in a cabinet.

b. Figure 2-2 illustrates the installation of a rack mounted unit with protruding panel.

c. Figure 2-3 illustrates the installation of a rack mounted unit with flush panel.

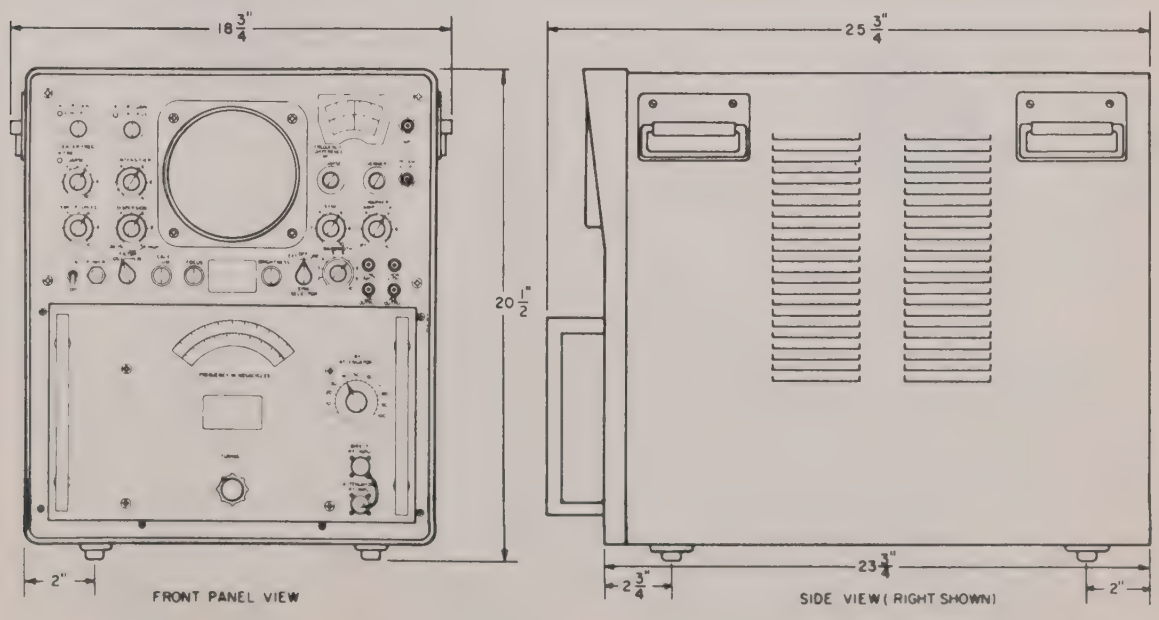



Figure 2-1. Outline Installation Drawing, Cabinet Mounted Unit

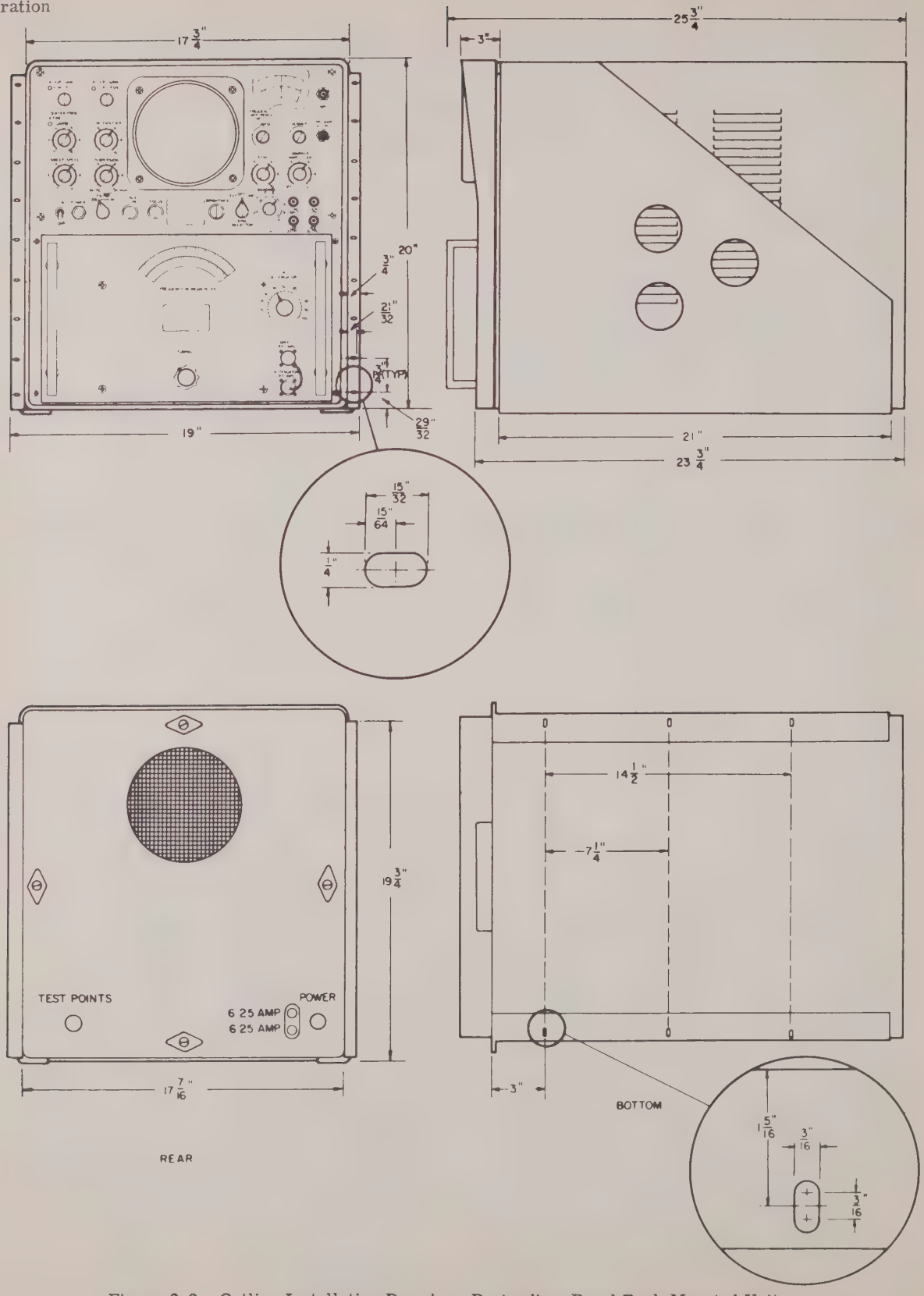



Figure 2-2. Outline Installation Drawing, Protruding-Panel Rack Mounted Unit

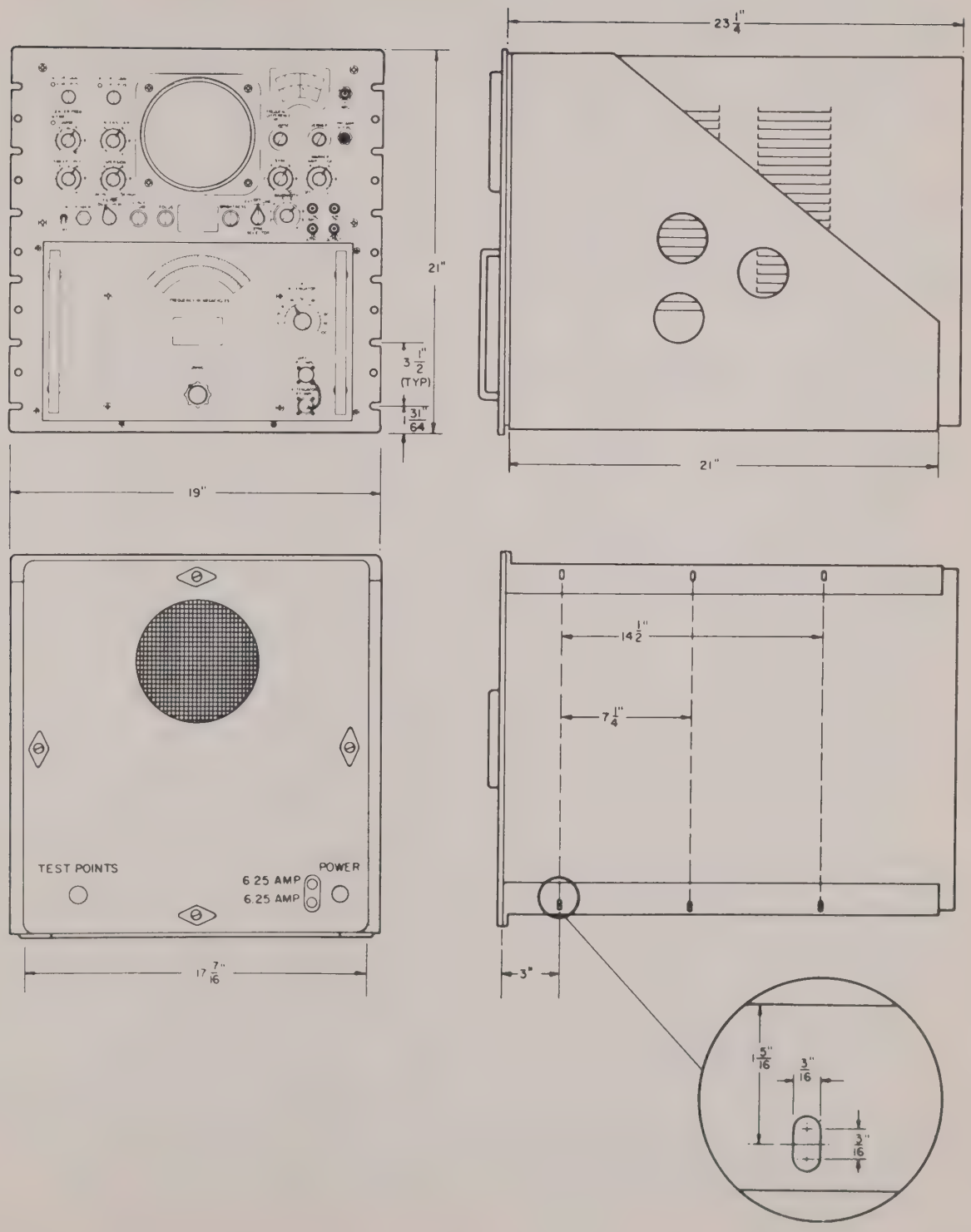



Figure 2-3. Outline Installation Drawing, Flush-Panel Rack Mounted Unit

When the Model TSA-W is to be used mounted in a cabinet, consider the use of instrument Dolly DA-4 for conserving bench space. If either of the rack mountings is to be used, select a position in the rack that will provide maximum accessibility and adequate ventilation.

## 2-5. CONTROLS, INDICATORS, AND CONNECTORS.

2-6. The operating controls, indicators and connectors of Model TSA-W are listed in table 2-1 and shown in figure 2-4. Haphazard operation or improper settings may cause damage to electronic equipment. For this reason, it is important to know the function of every control.

## 2-7. SPECTRUM ANALYZER MODEL TSA-W OPERATION.

2-8. PRELIMINARY OPERATING PROCEDURE. The procedure noted below is to be followed prior to making specific measurements with the TSA-W.

a. Before applying power to the Model TSA-W, the position of the line-voltage selector switch (115V/230V), located at the rear of the display chassis, must be checked (see figure 4-4). This requires that the chassis be removed from the cabinet. To do this, proceed as follows:

(1) Set the Model TSA-W on a bench so that the rear of the cabinet is accessible.

(2) Turn the four cam-lock screws located on the rear of the cabinet in a clockwise direction until they are loose.

(3) Slide the display chassis out of the cabinet.

(4) Set the line-voltage selector switch to the position desired for either 115-volt or 230-volt operation. When this switch is in the 115-volt factory set position, power is applied to both primary windings of T101, T102 and T103 in parallel. When it is changed to the 230-volt position, these same windings are placed in series.

**CAUTION**

THE 115/230 VOLT SWITCH IS FACTORY SET FOR 115-VOLT OPERATION. DAMAGE TO THE POWER SUPPLY COMPONENTS WILL RESULT IF 230 VOLTS ARE APPLIED TO THE TSA-W WHILE THE SWITCH IS IN THE 115-VOLT POSITION.

(5) Slide the display chassis back into the cabinet.

(6) Turn the four cam-lock screws in a clockwise direction until the chassis is locked in place.

**CAUTION**

USE CARE WHEN REMOVING AND REPLACING THE INSTRUMENT. DO NOT USE FORCE TO GET IT INTO OR OUT OF THE CABINET.

b. Connect a nominal 115/230 volt, 50 to 60 cps power source (50 to 1000 cps for the TSA-WF) to the power input receptacle J127 (located at the bottom rear of the Display Unit) via Electrical Power Cable Assembly W71 and Power Cable Adapter CP1.

**WARNING**

APPLICATION OF POWER TO THIS EQUIPMENT RESULTS IN VERY HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE. OBSERVE ALL SAFETY PRECAUTIONS AT ALL TIMES.

c. Turn the power ON-OFF switch to the ON position. The POWER pilot lamp will become illuminated, indicating that line power is being applied to the primaries of the power transformers in the low-voltage power supply.

d. Allow a fifteen-minute warm-up period for the local oscillator (located in the Tuning Unit) to stabilize.

e. Connect I-F Cable Assembly W80 as a jumper between the PREAMP OUTPUT jack and the IF INPUT jack.

f. Adjust the HOR GAIN, HOR POS, FOCUS and BRIGHTNESS controls to obtain a sharp base line on the crt screen.

g. Adjust the VERT POS control to locate the base line on the crt screen directly below the lowest horizontal line etched on the crt graticule.

h. Set the DISPERSION switch to the HIGH position.

i. Rotate the DISPERSION control fully clockwise.

j. Set LOG-FILTER-LIN switch in LIN position.

k. Rotate BANDWIDTH control maximum clockwise.

l. Rotate the VERT GAIN control fully clockwise.

m. Rotate the MARKER AMPLITUDE control fully clockwise.

TABLE 2-1. OPERATING CONTROLS, INDICATORS AND CONNECTORS

| Figure 2-4 Index No. | Front Panel Designation | Function |
|---|---|---|
| 1 | HOR GAIN and HOR POS controls | The GAIN control permits the varying of the width of the horizontal display on the crt. The POS control permits the display on the crt to be shifted either to the left or to the right. |
| 2 | INTENSIFIER control | Permits the adjustment of the intensity of the signal portion of the display only. |
| 3 | VERT GAIN and VERT POS controls | The POS control permits the display on the crt to be shifted either up or down. The GAIN control permits the adjustment of the height of the vertical display on the crt. |
| 4 | BRIGHTNESS control | Varies the brightness of the trace on the crt. |
| 5 | SYNC control | Permits the adjustment of the synchronizing voltage, permitting the phantastron generator to lock at sub-multiples of the line frequency. |
| 6 | FREQUENCY DIFFERENCE MC dial and COARSE and VERNIER controls | Rotation of the COARSE and VERNIER controls permits the location of the marker pip within ±40 mc of the i-f bandpass center frequency. Variation from the i-f bandpass center frequency is indicated on the FREQUENCY DIFFERENCE MC dial. |
| 7 | IF INPUT jack | Provided for applying either the output of the tuning unit or an external test signal to the display unit circuitry. |
| 8 | PREAMP OUTPUT jack | Provided for access to the output of the tuning unit. It also permits the use of the Polarad Model SD-1 Multipulse Spectrum Selector, which makes it possible for the TSA-W to analyze individual pulses in a pulse group. |
| 9 | MARKER AMPLITUDE control | This control, when rotated clockwise beyond its OFF position, permits the adjustment of the height of the marker pip on the crt. |
| 10 | BANDWIDTH control | Permits the varying of the resolution bandwidth from 1 to 80 kc. |
| 11 | SYNC INPUT jack | Provided for the application of an external synchronizing signal (with the SYNC SELECTOR switch in the EXT position) to the phantastron generator. |
| 12 | HOR OUTPUT jack | Provides output for external use of the horizontal sawtooth voltage. |
| 13 | VIDEO OUTPUT jack | Provides output for remote viewing of the video signal. |

(Cont'd)

TABLE 2-1. OPERATING CONTROLS, INDICATORS AND CONNECTORS (Cont'd)

| Figure 2-4 Index No. | Front Panel Designation | Function |
|---|---|---|
| 14 | LOG OUTPUT jack | Provides output for external use of a logarithmic signal. |
| 15 | SYNC SELECTOR switch | Permits the selection of either internal or external synchronization of the phantastron generator. When in the OFF position, the phantastron generator is free-running. |
| 16 | RF ATTENUATOR control | Permits the attenuation of the incoming r-f signals which are applied to the ATTENUATOR RF INPUT jack. The attenuation inserted by this control is variable between 0 and 100 db for use up to 12.4 KMC. |
| 17 | DIRECT RF INPUT jack | Provided for the direct application of incoming r-f signals. This connection utilizes the maximum sensitivity of the TSA-W. |
| 18 | ATTENUATOR RF INPUT jack | Provided for the connection of the incoming r-f signals to the RF ATTENUATOR for use up to 12.4 KMC. |
| 19 | TUNING control | Adjusts the frequency of the signal displayed on the crt. |
| 20 | SCALE ILLUM control | Controls the illumination of the crt graticule. |
| 21 | LOG-FILTER-LIN switch | Permits the selection of logarithmic, logarithmic-filter, linear-filter or linear vertical deflection on the cathode-ray tube. The filter positions introduce a video filter in the circuitry. |
| 22 | POWER pilot lamp | Indicates that TSA-W has been energized. |
| 23 | Power ON-OFF switch | Energizes the TSA-W by controlling application of primary power. |
| 24 | FOCUS control | Adjusts the sharpness of the CRT display. |
| 25 | SWEEP SPEED control | Permits control of the sweep repetition rate, which can be varied from 1 to 30 cps. |
| 26 | CENTER FREQUENCY COARSE and FINE controls | Permit adjustment of the center frequency of the sweep-frequency generator to position the display at the electrical center of the crt. |
| 27 | DISPERSION HIGH-LOW switch and DISPERSION control | The switch selects the dispersion range:<br>LOW - 60 kc to 10 mc<br>HIGH - 1 mc to 80 mc.<br>The control varies the dispersion within the range selected. |

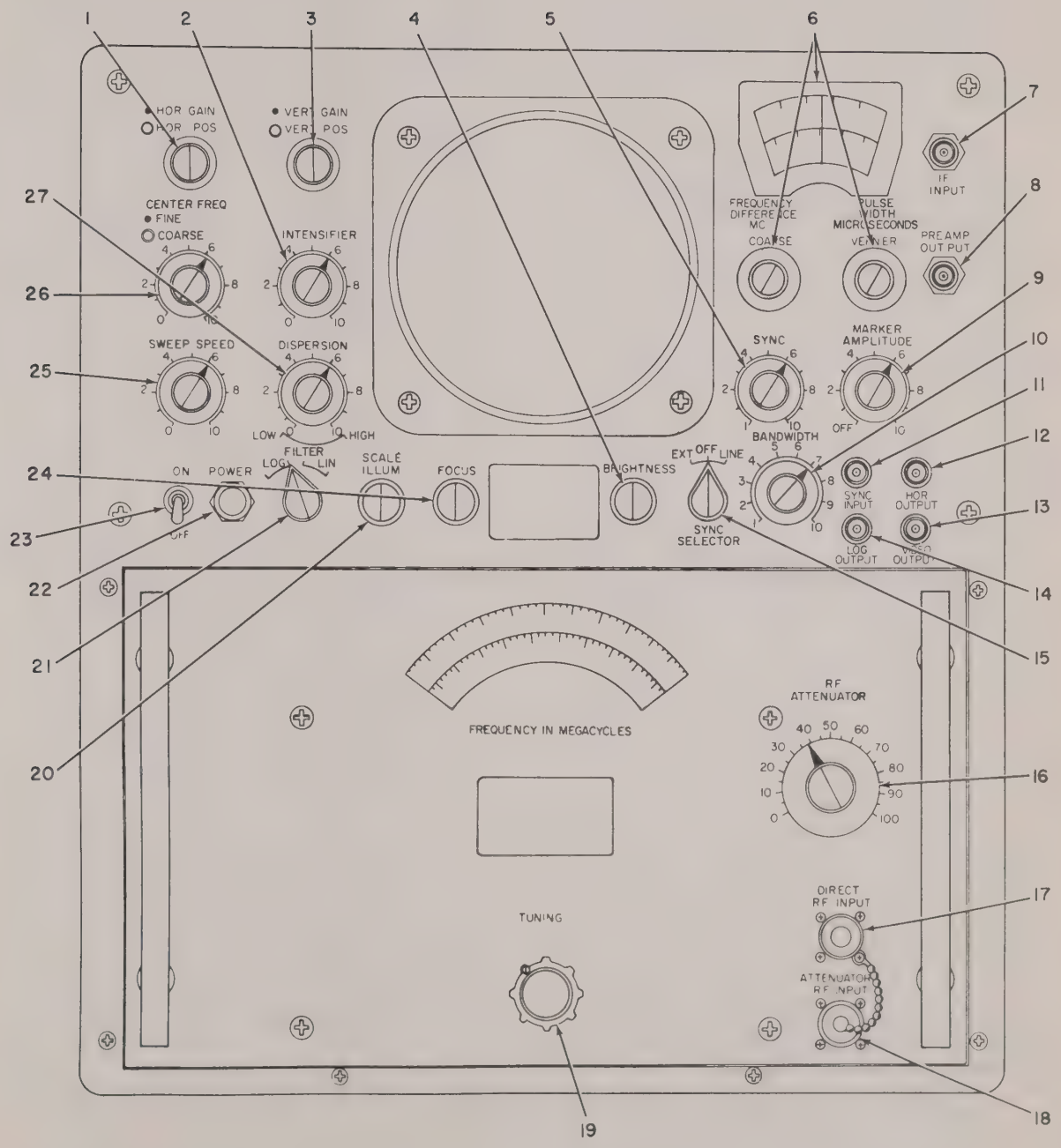



Figure 2-4. Operating Controls, Indicators and Connectors

n. Rotate the COARSE and VERNIER controls to line up the FREQUENCY DIFFERENCE MC dial 0 marks directly below the index hairline. This operation places the marker pip at the electrical center of the display.

o. Rotate the CENTER FREQUENCY controls to position the marker pip at the physical center of the crt display.

p. Set the SYNC SELECTOR switch in the OFF position.

q. Set the SWEEP SPEED control to 8.

r. Rotate the MARKER AMPLITUDE control to set the height of the marker pip at approximately three inches.

s. Check that the proper tuning unit for the frequency range to be covered has been installed.

t. Rotate the TUNING control to position the index at the low end of the FREQUENCY IN MEGACYCLES dial.

u. Connect the output jack of a microwave signal generator, with appropriate range for the particular tuning head, to the DIRECT RF INPUT jack via RF Cable Assembly W72 for a CW output of less than -20 dbm. If the output is greater than -20 dbm, the signal source should be connected to the ATTENUATOR RF INPUT. When this is done while using Tuning Units STU-1WA and STU-3WA, it is necessary to connect the ATTENUATOR OUTPUT to the DIRECT RF INPUT by means of the patch cable supplied with the unit.

v. Rotate the TUNING control until a pip representing the incoming r-f signal appears on the crt screen. The signal will enter the display from the right. If the display is excessively large, vary the VERT GAIN control to set the height of the pip at a convenient level.

w. Continue rotating the TUNING control until the pip representing the incoming r-f signal coincides with the MARKER pip.

x. The frequency of the unknown signal is then read directly from the FREQUENCY IN MEGACYCLES dial. However, when Tuning Unit STU-1WA, STU-2WA or STU-3WA is being used, it is necessary to determine which of the two frequency bands marked on the dial is to be read. To determine which of the two frequency bands is to be read, proceed as follows:

(1) Align the true signal display with the marker pip.

(2) Set the FREQUENCY DIFFERENCE MC dial to read 40 mc. This will move the marker pip 40 mc away from the display signal.

(3) Note the readings of the bands marked on the FREQUENCY IN MEGACYCLES dial.

(4) Adjust the TUNING control until the signal display is aligned with the marker pip.

(5) Again note the readings of the bands marked on the FREQUENCY IN MEGACYCLES dial. The band on which the frequency reading has changed by 40 mc from the reading obtained in step (3) is the one that will be used to read the frequency of the unknown signal.

y. Set the FREQUENCY DIFFERENCE MC dial to zero and align the signal display with the marker pip. Read the frequency of the unknown signal from the FREQUENCY IN MEGACYCLES dial using the band noted in step x(5).

2-9. MEASUREMENT OF RELATIVE R-F POWER. The relative r-f power difference between two signal sources may be measured in the following manner: Assume that two signal pips appear on the crt display, separated by not more than 80 mc. In this example, the larger signal pip is termed "A" and the smaller "B".

a. Position the LOG-FILTER-LIN switch to LIN.

(1) Observe the position of the smaller signal, pip B. Mark its location on the crt graticule and note its height. For example, pip B reaches a height of 1 cm.

(2) Rotate the TUNING control to position the second signal, pip A, to the mark that located pip B. Note the height of pip A. For example, pip A reaches a height of 3.5 cm.

(3) Refer to the voltage ratio to decibels conversion table (table 2-2), which shows that, for a voltage ratio of 3.5 to 1, signal pip A is approximately 10.9 db greater than signal pip B. The relative difference, in db, of the two signals can also be found by use of the following formula:

Relative difference (in db)

$$= 20 \log_{10} \frac{\text{Height of signal pip A}}{\text{Height of signal pip B}}$$

$$= 20 \log_{10} \frac{3.5 \text{ cm}}{1 \text{ cm}} = 20 \log_{10} 3.5$$

$$= 20 \times 0.544 = 10.88$$

b. Position the LOG-FILTER-LIN switch to LOG.

(1) Observe the position of the smaller signal, pip B. Mark its location on the crt graticule and note its height.

(2) Rotate the TUNING control to position the second signal, pip A, to the mark that located pip B. Note the height of pip A.

(3) The difference in height between pips A and B, in graticule divisions, multiplied by 3, is the relative difference of signal amplitude, in db.

2-10. USING THE VOLTAGE RATIO TO DB CONVERSION TABLE. The relation of voltage ratio to db can be determined rapidly by referring to table 2-2 and using the following procedure:

a. Convert the ratio of signal heights to a number consisting of units, tenths, and hundredths.

b. Locate the number obtained in step a above, (or the number closest to it), in the body of table 2-2.

c. Read the db value of the signal height ratio in the following manner:

(1) Note the whole number appearing in the +DB (if the signal height ratio is greater than one) or -DB (if the signal height ratio is less than one) column found at the left or right, respectively, of table 2-2, corresponding to the row in which the ratio appears.

(2) Note the decimal portion appearing at the head of table 2-2 which corresponds to the column in which the voltage ratio appears.

(3) Add the two values obtained in steps 1 and 2, above. This is the db ratio of the signal amplitudes.

Example: If the signal height ratio is 3.5, locate the value 3.51 (the number closest to 3.5) in the main body of the table. The number in the +DB column corresponding to this is 10. Next, locate the decimal portion by locating the head of the column in which the ratio appears, or 0.9. Adding these two numbers, the db ratio of +10.9 is obtained.

2-11. MEASUREMENT OF ABSOLUTE POWER. To determine the absolute power level of a signal that is under observation, proceed as outlined in paragraph 2-9. Then proceed as directed in the following steps:

a. Rotate the FREQUENCY DIFFERENCE MCS control to position the marker pip beside the pip representing the incoming r-f signal.

b. If the pip representing the incoming signal fluctuates in amplitude, adjust the MARKER AMPLITUDE control so that the marker pip height corresponds to the maximum amplitude of the signal pip.

c. Remove the incoming r-f signal from the TSA-W input jack.

**Note**

Be careful to avoid disturbing the settings of all the controls on the front panel of the TSA-W.

d. Apply the same type of signal from a calibrated signal generator to the same input jack. Tune the generator to position the pip representing its output signal where the unknown signal was, (beside the marker pip).

e. Adjust the power level control of the signal generator to obtain a signal pip which has the same height as the marker pip appearing on the crt screen. The absolute power level of the signal being analyzed may now be determined by reading the power setting of the signal generator.

**Note**

If the original signal under observation was applied to the TSA-W through an attenuator (either internal or external), the amount of attenuation must be taken into account and added to the reading of the signal generator power setting.

2-12. DETERMINING THE WIDTH OF ANY LOBE OF A SIGNAL SPECTRUM. To determine the width of any lobe of a signal spectrum, proceed as outlined below:

a. Connect operating power to the TSA-W.

b. Connect I-F Cable Assembly W80 as a jumper between the PREAMP OUTPUT jack and the IF INPUT jack.

c. Adjust the HOR GAIN, HOR POS, FOCUS, and BRIGHTNESS controls to obtain a sharp base line on the crt screen.

d. Adjust the VERT POS control to locate the base line on the crt screen directly below the horizontal line etched with vertical marks on the crt graticule.

e. Set the DISPERSION switch to the HIGH position.

f. Rotate the DISPERSION control fully clockwise.

g. Rotate the VERT GAIN control to obtain approximately one-eighth inch of noise on the crt screen.

h. Rotate the MARKER AMPLITUDE control clockwise, beyond its OFF position.

i. Rotate the FREQUENCY DIFFERENCE MCS TUNING control to line up the 0 mark (inscribed on the DIFFERENCE FREQ-MCS dial) directly below the index hair-line.

j. Rotate the CENTER FREQUENCY control to position the marker pip at the physical center of the crt screen.

k. Set the SYNC SELECTOR switch to the OFF position.

l. Set the SWEEP SPEED control to 8.

TABLE 2-2. RELATION OF VOLTAGE RATIO TO DB*

| +DB | 0.0 | 0.0 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | -DB |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.... | 1.00<br>1.00 | 1.01<br>.989 | 1.02<br>.977 | 1.04<br>.966 | 1.05<br>.955 | 1.06<br>.944 | 1.07<br>.933 | 1.08<br>.923 | 1.10<br>.912 | 1.11<br>.902 | .... 0 |
| 1.... | 1.12<br>.891 | 1.14<br>.881 | 1.15<br>.871 | 1.16<br>.861 | 1.18<br>.851 | 1.19<br>.841 | 1.20<br>.832 | 1.22<br>.822 | 1.23<br>.813 | 1.25<br>.804 | .... 1 |
| 2.... | 1.26<br>.794 | 1.27<br>.785 | 1.29<br>.776 | 1.30<br>.767 | 1.32<br>.759 | 1.33<br>.750 | 1.35<br>.741 | 1.37<br>.733 | 1.38<br>.724 | 1.40<br>.716 | .... 2 |
| 3.... | 1.41<br>.708 | 1.43<br>.700 | 1.45<br>.692 | 1.46<br>.684 | 1.48<br>.676 | 1.50<br>.668 | 1.51<br>.661 | 1.53<br>.653 | 1.55<br>.646 | 1.57<br>.638 | .... 3 |
| 4.... | 1.58<br>.631 | 1.60<br>.624 | 1.62<br>.617 | 1.64<br>.610 | 1.66<br>.603 | 1.68<br>.596 | 1.70<br>.589 | 1.72<br>.582 | 1.74<br>.575 | 1.76<br>.569 | .... 4 |
| 5.... | 1.78<br>.562 | 1.80<br>.556 | 1.82<br>.550 | 1.84<br>.543 | 1.86<br>.537 | 1.88<br>.531 | 1.91<br>.525 | 1.93<br>.519 | 1.95<br>.513 | 1.97<br>.507 | .... 5 |
| 6.... | 2.00<br>.501 | 2.02<br>.495 | 2.04<br>.490 | 2.07<br>.484 | 2.09<br>.479 | 2.11<br>.473 | 2.14<br>.468 | 2.16<br>.462 | 2.19<br>.457 | 2.21<br>.452 | .... 6 |
| 7.... | 2.24<br>.447 | 2.26<br>.442 | 2.29<br>.437 | 2.32<br>.432 | 2.34<br>.427 | 2.37<br>.422 | 2.40<br>.417 | 2.43<br>.412 | 2.46<br>.407 | 2.48<br>.403 | .... 7 |
| 8.... | 2.51<br>.398 | 2.54<br>.394 | 2.57<br>.389 | 2.60<br>.385 | 2.63<br>.380 | 2.66<br>.376 | 2.69<br>.372 | 2.72<br>.367 | 2.75<br>.363 | 2.79<br>.359 | .... 8 |
| 9.... | 2.82<br>.355 | 2.85<br>.351 | 2.88<br>.347 | 2.92<br>.343 | 2.95<br>.339 | 2.99<br>.335 | 3.02<br>.331 | 3.05<br>.327 | 3.09<br>.324 | 3.13<br>.320 | .... 9 |
| 10.... | 3.16<br>.316 | 3.20<br>.313 | 3.24<br>.309 | 3.27<br>.305 | 3.31<br>.302 | 3.35<br>.298 | 3.39<br>.295 | 3.43<br>.292 | 3.47<br>.288 | 3.51<br>.285 | ....10 |
| 11.... | 3.55<br>.282 | 3.59<br>.279 | 3.63<br>.275 | 3.67<br>.272 | 3.72<br>.269 | 3.76<br>.266 | 3.80<br>.263 | 3.85<br>.260 | 3.89<br>.257 | 3.94<br>.254 | ....11 |
| 12.... | 3.98<br>.251 | 4.03<br>.248 | 4.07<br>.245 | 4.12<br>.243 | 4.17<br>.240 | 4.22<br>.237 | 4.27<br>.234 | 4.32<br>.232 | 4.37<br>.229 | 4.42<br>.226 | ....12 |
| 13.... | 4.47<br>.224 | 4.52<br>.221 | 4.57<br>.219 | 4.62<br>.216 | 4.68<br>.214 | 4.73<br>.211 | 4.79<br>.209 | 4.84<br>.207 | 4.90<br>.204 | 4.95<br>.202 | ....13 |
| 14.... | 5.01<br>.200 | 5.07<br>.197 | 5.13<br>.195 | 5.19<br>.193 | 5.25<br>.191 | 5.31<br>.188 | 5.37<br>.186 | 5.43<br>.184 | 5.50<br>.182 | 5.56<br>.180 | ....14 |
| 15.... | 5.62<br>.178 | 5.69<br>.176 | 5.75<br>.174 | 5.82<br>.172 | 5.89<br>.170 | 5.96<br>.168 | 6.03<br>.166 | 6.10<br>.164 | 6.17<br>.162 | 6.24<br>.160 | ....15 |
| 16.... | 6.31<br>.158 | 6.38<br>.157 | 6.46<br>.155 | 6.53<br>.153 | 6.61<br>.151 | 6.68<br>.150 | 6.76<br>.148 | 6.84<br>.146 | 6.92<br>.145 | 7.00<br>.143 | ....16 |
| 17.... | 7.08<br>.141 | 7.16<br>.140 | 7.24<br>.138 | 7.33<br>.136 | 7.41<br>.135 | 7.50<br>.133 | 7.59<br>.132 | 7.67<br>.130 | 7.76<br>.129 | 7.85<br>.127 | ....17 |
| 18.... | 7.94<br>.126 | 8.04<br>.124 | 8.13<br>.123 | 8.22<br>.122 | 8.32<br>.120 | 8.41<br>.119 | 8.51<br>.117 | 8.61<br>.116 | 8.71<br>.115 | 8.81<br>.114 | ....18 |
| 19.... | 8.91<br>.112 | 9.02<br>.111 | 9.12<br>.110 | 9.23<br>.108 | 9.33<br>.107 | 9.44<br>.106 | 9.55<br>.105 | 9.66<br>.104 | 9.77<br>.102 | 9.89<br>.101 | ....19 |
| 20.... | 10.0<br>.100 | | | | | | | | | | ....20 |

*Refer to Page 2-9 for an explanation on how to use the above table.

m. Rotate the MARKER AMPLITUDE control to set the height of the marker pip at approximately three inches.

n. Refer to paragraph 1-10 for applicable tuning heads to cover the various frequency ranges from 10 through 40,000 mc.

o. Utilize the Model STU-1WA, STU-2WA, STU-3WA, or STU-5WA Tuning Head to cover the range of the signal under observation.

p. Rotate the TUNING control to locate the marker pip at the center of the spectrum lobe under observation.

q. Rotate the FREQUENCY DIFFERENCE MCS TUNING control so that the marker pip coincides with one edge of the spectrum lobe under observation.

r. Note the reading on the DIFFERENCE FREQ-MCS dial.

s. Rotate the FREQUENCY DIFFERENCE MCS TUNING control so that the marker pip coincides with the other edge of the spectrum lobe.

t. Note the reading on the DIFFERENCE FREQ-MCS dial.

u. Calculate the difference, in megacycles, between the readings obtained in steps r and s above. This figure is the width, in megacycles, of the particular lobe appearing in the crt display.

2-13. FINE FREQUENCY MEASUREMENT. If more than one signal is to be examined on the crt screen, the internal marker circuit may be used to determine the frequency difference between the two signals. This marker circuit is independent of the TUNING control and may be used to "set" the position on the crt screen of one signal while tuning to the second. If the signals are close in frequency, and both are seen on the crt screen, the marker pip may be moved by means of the FREQUENCY DIFFERENCE MCS TUNING control. This control accurately determines small frequency differences where the TUNING control is too coarse an adjustment. If two frequencies are very close together, as in multi-frequency transmitters, the frequency relationship can be carefully checked. The DISPERSION control and DISPERSION switch vary the dispersion of the display so that, at maximum dispersion, 80 mc appears across the crt screen and, at minimum dispersion, 60 kc is displayed. The minimum setting of the BANDWIDTH control makes it possible to use the TSA-W to its minimum resolution of 1 kc. Two signals can be thus distinguished if their frequency difference is 1 kc or more.

2-14. MEASURING FREQUENCY DRIFT. The marker pip and the FREQUENCY DIFFERENCE MCS TUNING control provide a method to determine frequency drift of any piece of equipment operating within the tuning range of the TSA-W. Set the marker pip so that it coincides with the signal under observation at the beginning of the test. The position of the DIFFERENCE FREQ-MCS dial is noted. At the end of the test, if the drift of the signal has been small, the marker pip may be moved to the new position of the signal on the crt screen. The difference between the original and new readings of the DIFFERENCE FREQ-MCS dial equals the actual drift of the signal under test. Generally, the period drift is not of as much interest as "frequency pulling", due to tighter coupling or changing load conditions. Again, the same "before and after" procedure may be used with the FREQUENCY DIFFERENCE MCS TUNING control now serving to determine the exact degree of "frequency pulling".

2-15. CHECKING FOR CONTINUOUS TRANSMITTER OUTPUT. The visual display of the TSA-W makes it useful in checking for "holes" in transmitter or signal generator operation. Often, using conventional test methods, low output or discontinuous operation over a small frequency range is not noticed. However, by tuning the equipment under test through its range, and tracking with the TUNING control on the TSA-W, the wide dispersion is used to permit careful examination of the entire spectrum.

2-16. REPRESENTATIVE SPECTRA. Figure 2-6 illustrates various types of spectra that may be observed on the crt screen of the TSA-W. These types of "pictures" may be observed when checking the spectrum of pulsed magnetron oscillators. The display will indicate the pulse width, pulse shape, and the amount of amplitude or frequency modulation on the pulse. In this way, the TSA-W may be used to determine the extent and type of modulation present in what should be a cw signal or a pulsed signal. The data presented in figure 2-6 may be summarized as follows:

a. Amplitude modulation tends to change the position of the null points.

b. Frequency modulation tends to raise the null points.

c. A combination of amplitude and frequency modulation tends to distort the symmetry of the spectrum.

d. Having established the presence of distortion in the spectrum, measurements can be made to determine the nature of the modulating pulse. Side bands associated with amplitude and frequency modulated signals may be observed and measured. The relative power between side lobes and the main lobes may be determined with a calibrated r-f attenuator. Also, the half-power points of the main lobe can be determined with a calibrated r-f attenuator by noting the signal amplitude on the screen before and after 3-db of attenuation is inserted.

2-17. MEASURING INCIDENTAL FM OF AN APPLIED SIGNAL. To measure the incidental

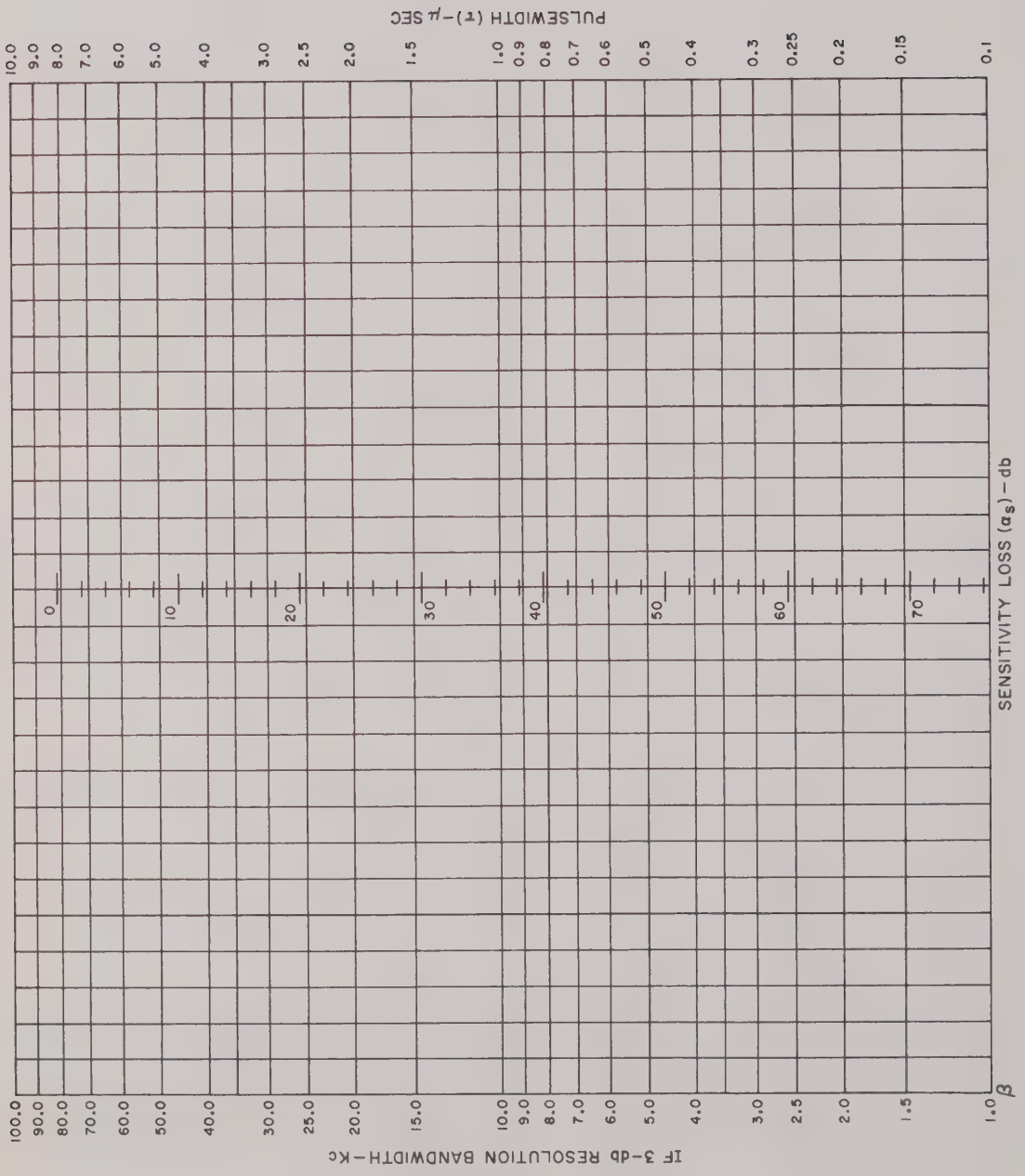



Figure 2-5. Sensitivity Loss as a Function of Signal Pulse Width and Bandwidth

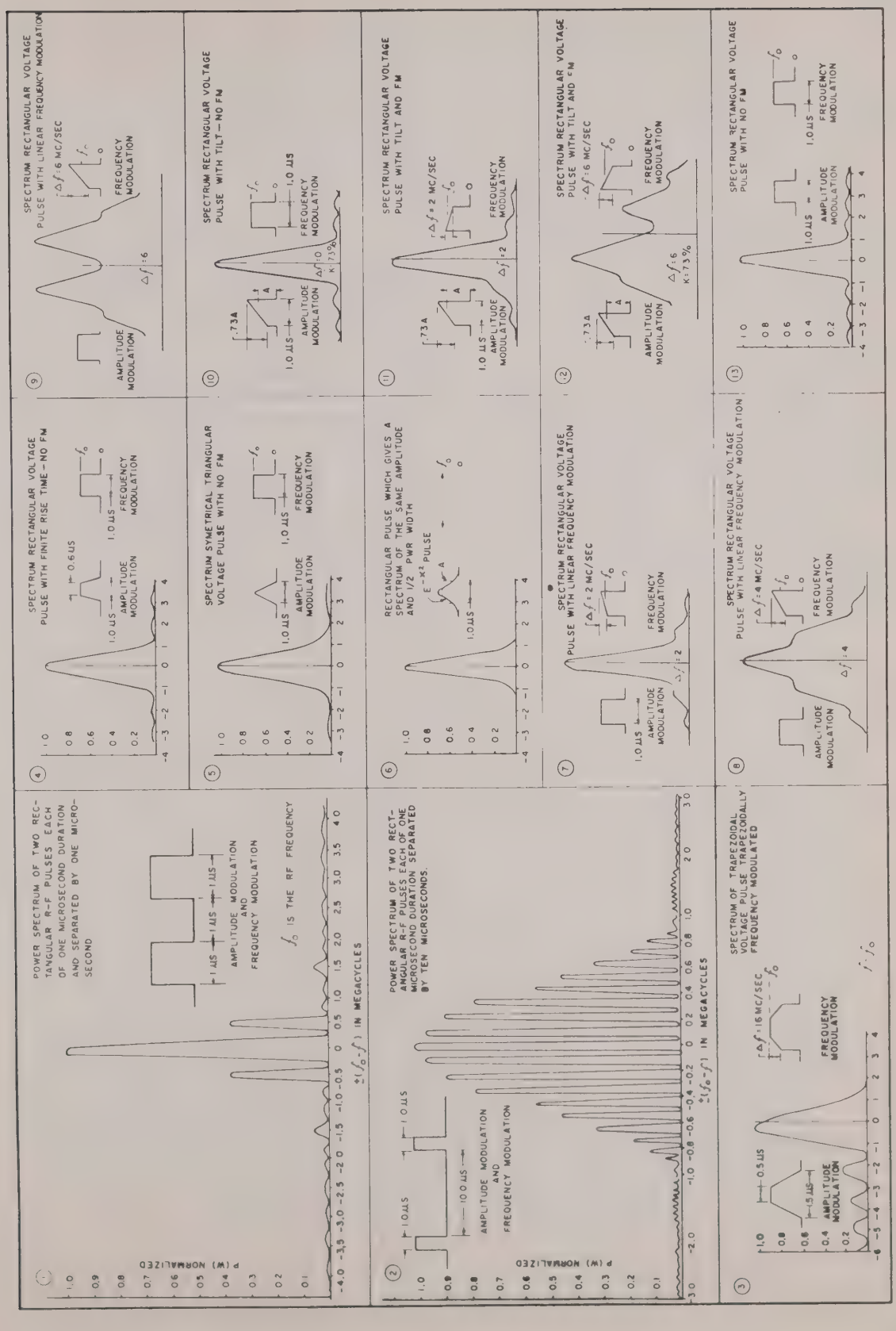

POWER SPECTRUM OF TWO RECTANGULAR R-F PULSES EACH OF ONE MICROSECOND DURATION AND SEPARATED BY ONE MICROSECOND
AMPLITUDE MODULATION AND FREQUENCY MODULATION
$f_0$ IS THE RF FREQUENCY
P (W) NORMALIZED
$\pm(f_0-f)$ IN MEGACYCLES
POWER SPECTRUM OF TWO RECTANGULAR R-F PULSES EACH OF ONE MICROSECOND DURATION SEPARATED BY TEN MICROSECONDS.
SPECTRUM OF TRAPEZOIDAL VOLTAGE PULSE TRAPEZOIDALLY FREQUENCY MODULATED
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH FINITE RISE TIME – NO FM
SPECTRUM SYMETRICAL TRIANGULAR VOLTAGE PULSE WITH NO FM
RECTANGULAR PULSE WHICH GIVES A SPECTRUM OF THE SAME AMPLITUDE AND 1/2 PWR WIDTH
$E=K^2$ PULSE
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH LINEAR FREQUENCY MODULATION
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH LINEAR FREQUENCY MODULATION
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH TILT – NO FM
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH TILT AND FM
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH TILT AND FM
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH NO FM
AMPLITUDE MODULATION
FREQUENCY MODULATION

Figure 2-6. Representative Spectra in Signal Analysis

fm of a signal, refer to figure 2-7 and proceed as follows:

a. Apply the signal to the appropriate input jack of the TSA-W and adjust the front panel controls so that the main lobe appears on the crt screen.

b. Adjust the VERT GAIN control so that the main lobe occupies three-quarters of the crt display.

c. Use the FREQUENCY DIFFERENCE MCS TUNING control to calibrate the bandwidth from one edge of the crt graticule to the other. Divide this bandwidth figure by 10 to find the frequency change by graticule division.

d. Rotate the SWEEP SPEED control fully counterclockwise.

e. Draw two lines to indicate the pulse envelope (see lines A and B of figure 2-7). Draw a horizontal line (C) from one side of the envelope to the other. Drop two vertical lines (D and E) to the base line from the points on the inner and outer edges of the envelope crossed by the horizontal line (C).

f. Count the number of divisions between lines D and E at the base. Use the frequency change per scale division, obtained in step c above, to calculate the frequency change. This frequency change represents the incidental fm of both the applied signal and that inherent within the TSA-W.

g. Measure the inherent incidental fm of the TSA-W by using a stable r-f signal at the same frequency as the applied signal. Subtract this from the total frequency change calculated in step f. The above procedure determines the incidental FM measurement of the applied signal.

2-18. PROPER USE OF BANDWIDTH CONTROL. Resolution, the ability to separate individual signals, is dependent upon both the rate of frequency sweep and the bandwidth of the i-f amplifier. When comparing two cw signals separated by a small frequency difference, rotate the BANDWIDTH control in a counterclockwise direction until the two signals are completely separated. If the two signals are so close that the BANDWIDTH control cannot separate them, a beat signal will be observed on the cathode-ray tube screen. This may be virtually eliminated by turning the LOG-FILTER-LIN switch to the applicable FILTER position. This introduces a video filter designed expressly for the removal of beat signals. For optimum resolution of a single or of widely separated cw signals, the BANDWIDTH control should be rotated counterclockwise until the amplitude of the signal starts to decrease. The sensitivity of the spectrum analyzer is dependent upon the

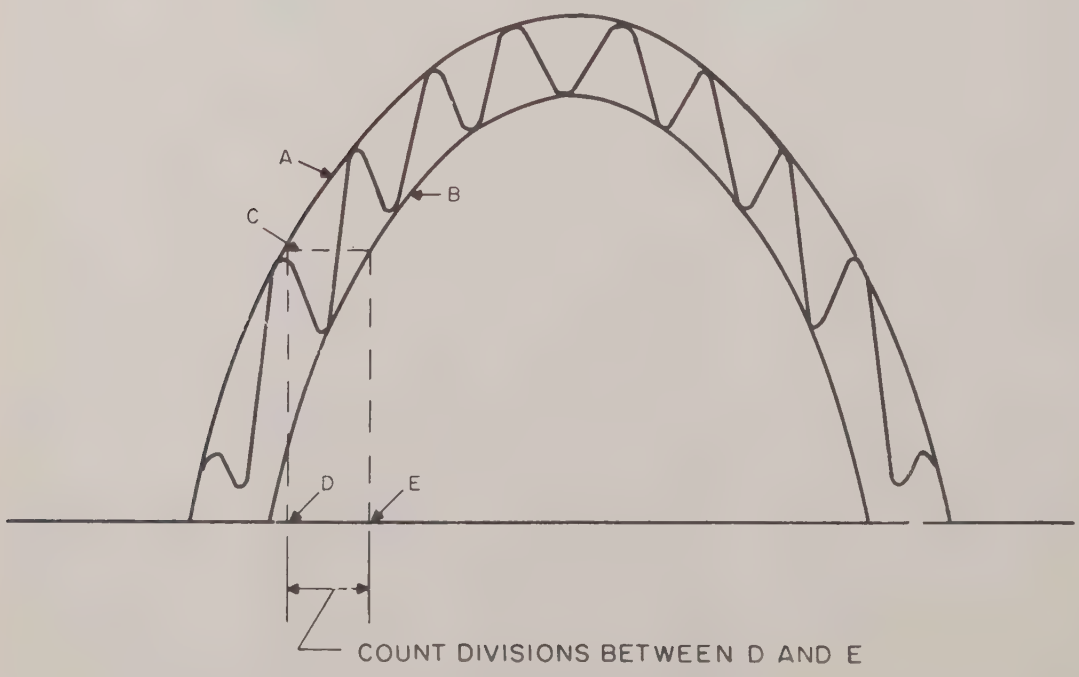



Figure 2-7. Technique for Measuring Incidental FM

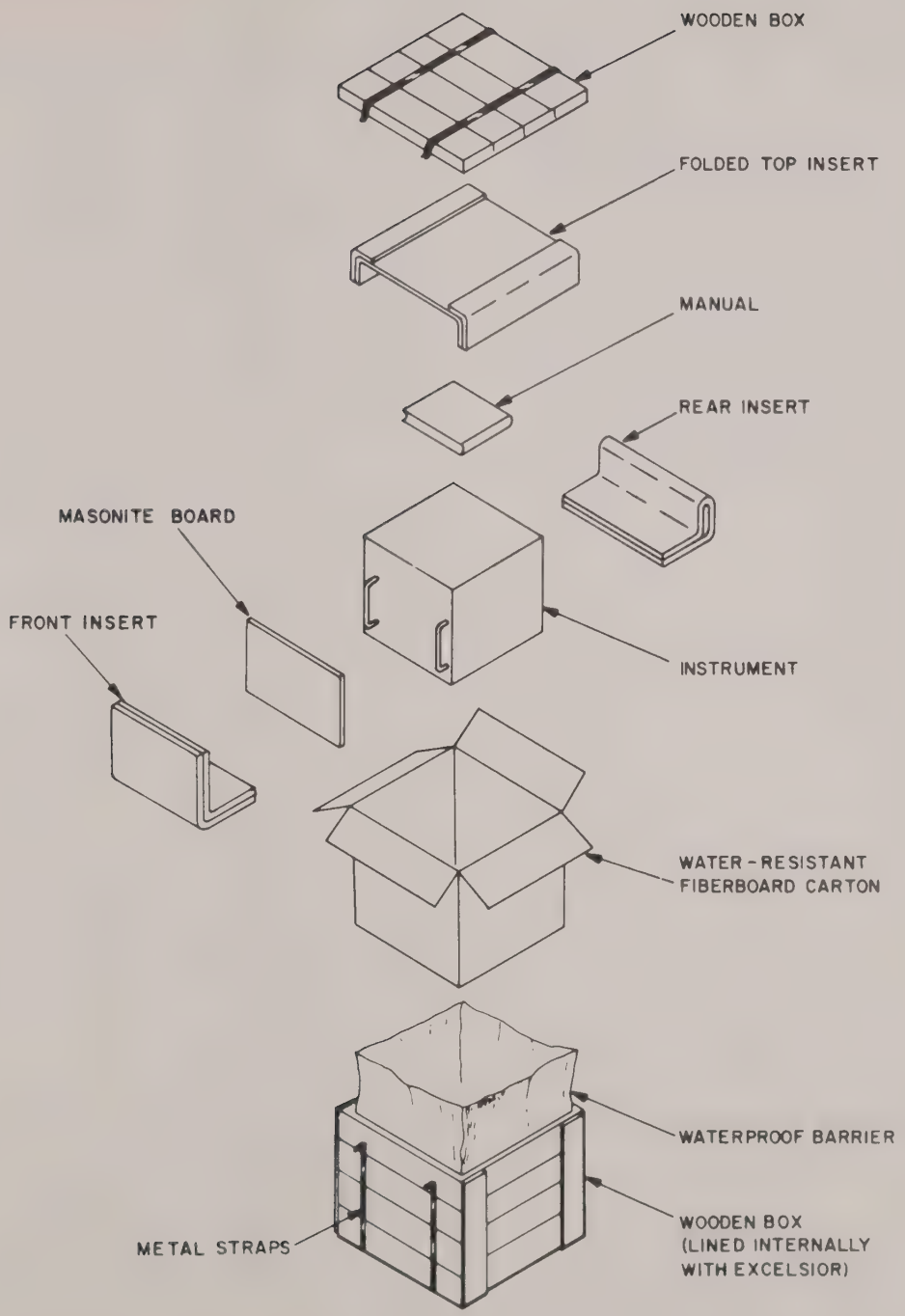



Figure 2-8. Packaging Diagram

dispersion, i-f bandwidth and sweep speed. When displaying a pulse spectrum, the sensitivity of the spectrum analyzer is dependent only upon the bandwidth. The sweep speed should be adjusted so that approximately 50 prf lines appear in the main lobe and the first side lobe on either side of the main lobe. For optimum resolution of the pulse spectrum, the product of i-f bandwidth and pulse width must be less than 0. 1. If the bandwidth is greater than this value, the minima of the spectrum is no longer zero. This loss of sensitivity due to bandwidth and pulse width reduces the dynamic range of the spectrum analyzer for pulse-modulated signals. See figure 2-5.

## 2-19. PACKAGING INSTRUCTIONS.

2-20. PACKAGING FOR SHORT TERM STORAGE. If the Model TSA-W is to be stored for a relatively short period, cover it with a suitable protective covering such as a sheet of plastic or paper. Put the accessories and instruction manual in a carton or bag and fasten it to the unit to prevent loss. Store the Model TSA-W in a clean dry area where it will not be subject to extreme temperature.

2-21. PACKAGING FOR LONG TERM STORAGE OR SHIPMENT. If the Model TSA-W is to be stored for a long period of time, or shipped, proceed as follows:

a. If the original wrappings and carton have been saved, use them to package the equipment as shown in figure 2-8.

b. If new packing materials are to be used, assemble the necessary wrappings and carton.

c. Wrap the equipment in a moisture and vapor-proof barrier such as plastic or waterproof paper.

d. Wrap the accessories and instruction manual in a moisture and vapor-proof barrier.

e. Place the package in a suitable carton. Fill all empty spaces in the carton with suitable packing to prevent shifting of the packages within the carton.

f. Seal and mark the carton.

g. If the storage or shipping conditions make it necessary, enclose the carton within an outer carton or wooden box.

# SECTION III

# THEORY OF OPERATION

## 3-1. INTRODUCTION.

3-2. The Model TSA-W is basically a superheterodyne receiver using multi-conversion. It covers the frequency range between 10 and 44,000 mc. The Model TSA-W displays the frequency of the applied signal along its X axis while the amplitude of the frequency is displayed on the Y axis. This provides an accurate spectral display of the applied signal frequency. This section discusses the theory of operation for the Model TSA-W. It is divided into two sections, a simplified block diagram analysis and a detailed circuit analysis.

3-3. In order to simplify the discussion of the theory of operation the Model TSA-W may be divided into two major components: one of the five models of tuning units, STU-1WA, STU-2WA, STU-3WA, STU-4WA and STU-5WA, depending on the frequency range desired, and the model DU-2A basic unit.

## 3-4. SIMPLIFIED BLOCK DIAGRAM ANALYSIS. (See figure 3-1).

3-5. RF TUNING UNIT. The tuning unit consists of the 1st mixer and local oscillator. The mixer combines the incoming r-f signal with the local oscillator signal to produce the 160 mc i-f signal that is fed to the input of the wide band i-f amplifier. All tuning units except the Model STU-1WA use a klystron as the local oscillator. All tuning units use crystal mixers to combine the rf and local oscillator signals.

NOTE

Tuning Unit Model STU-1WA only uses a 6AF4 as the local oscillator. In addition it contains a wide band amplifier. After passing through the STU-1WA wide band amplifier the 160 mc i-f signal is fed to a wide band-pass filter and a narrow band-pass filter. These filters reduce spurious response in the 10 to 55 mc frequency range. The signal is then fed through a low-pass filter to the input of the wide band i-f amplifier.

3-6. WIDE-BAND I-F AMPLIFIER. The wide-band i-f amplifier, which has a center frequency of 160 mc, is a stagger-damped amplifier which offers 80-mc bandwidth to the first i-f signal output of the first crystal mixer. This amplifier also passes the marker signal with the first i-f, raising the level of both to a value suitable for further conversion.

3-7. SWEEP-FREQUENCY GENERATOR. The sweep-frequency generator is a local oscillator capable of producing a swept-frequency output centered at 224 mc. The frequency deviation from the center frequency is determined by the setting of the DISPERSION HIGH-LOW switch and the DISPERSION control. The sweep-frequency generator serves to heterodyne the first i-f signal (centered at 160 mc) with the output of the swept-frequency oscillators, producing the second intermediate frequency centered at 64 mc.

3-8. NARROW-BAND I-F AMPLIFIER. The narrow-band i-f amplifier serves to amplify the 64-mc second i-f output of the sweep-frequency generator, and then converts this signal to a 6-mc third i-f. The signal then undergoes a final conversion to a 500 kc fourth i-f and is amplified and detected for application to the video amplifier.

3-9. VARIABLE BANDWIDTH I-F CONTROL AMPLIFIER. The variable bandwidth i-f control amplifier, which is connected between the first and second converters of the narrow-band i-f amplifier, serves to adjust the resolution bandwidth of the fourth i-f signal between the limits of 1 and 80 kc, as determined by the BANDWIDTH control.

3-10. VIDEO CHASSIS. The video chassis contains the necessary circuits for amplifying the detected fourth i-f signal for application to the cathode-ray tube. The video chassis also contains the circuitry required for the generation of the required crt sweep voltages, for intensifying the video information presented on the cathode-ray tube display and for blanking out the cathode-ray tube sweep retrace.

3-11. MARKER OSCILLATOR. The marker oscillator produces a frequency that may be varied from 120 mc to 200 mc. This frequency is fed to the input of the wide band i-f amplifier. The COARSE control permits coarse adjustment of the marker oscillator frequency while the VERNIER control permits a vernier adjustment of the frequency. The MARKER AMPLITUDE control varies the amplitude of the marker output voltage, which in turn varies the size of the marker pip appearing on the signal display.

3-12. POWER SUPPLIES. Four electronically regulated power supplies are employed to obtain the dc voltages necessary for the operation of the Model TSA-W. The -1250 and -325 volt supply provides the operating voltages necessary for the operation of the klystron. The other three supplies, the -150, the +125, and the +300 volt supplies provide the necessary plate and biasing voltages for the operation of the rest of the TSA-W and tuning unit.

## 3-13. DETAILED CIRCUIT ANALYSIS.

3-14. The simplified and detailed block diagrams, figures 3-1 and 3-2 respectively, should be used in conjunction with the schematic diagrams, figures 5-1 through 5-10.

3-15. TUNING UNIT LOCAL OSCILLATOR. (See figures 5-6 thru 5-10.) All tuning units with the exception of the Model STU-1WA employ a klystron as the local oscillator. The STU-1WA employs a 6AF4 triode tube as a tuned transmission line oscillator. When a klystron is used as the local oscillator it is operated in a typical reflex klystron oscillator circuit. The frequency of the local oscillator is always 160 mc higher than the frequency of the incoming signal. In the higher band of operation, (tuning units STU-1WA through STU-3WA have two bands), the second harmonic of the local oscillator is used to beat with the incoming signal. The reflex klystron oscillator operates at a 3/4 wavelength cavity mode. It is tuned by changing the position of a non-contacting short-circuiting choke assembly within the oscillator cavity and by changing the reflector voltage. For example, the Model STU-2WA tuning unit employs a 1-3/4 mode over the frequency range from 910 mc to 1500 mc. In the vicinity of 1500 mc the reflector voltage becomes excessively high and mode switching is employed. At the mode switch point a microswitch is activated by a nylon cam on the tracking potentiometer shaft. Activating the microswitch reduces the reflector voltage to the proper value for the new mode of operation. The voltage applied to the reflector of the klystron is simultaneously tracked with tuning dial rotation by means of the tracking potentiometer. The 6X4 protects the klystron by preventing the reflector from going positive with respect to the cathode. The tuned transmission line oscillator used in tuning unit Model STU-1WA is also operated at a frequency 160 mc higher than the incoming signal. When the STU-1WA is being operated on its higher band, the second harmonic of the local oscillator is used to beat with the incoming signal. The parallel transmission line which tunes the oscillator is operated in a 1/4 wave mode. It is tuned by changing the position of a contacting short-circuit. The contacting short is tracked with the tuning dial by means of the tuning dial drive gears.

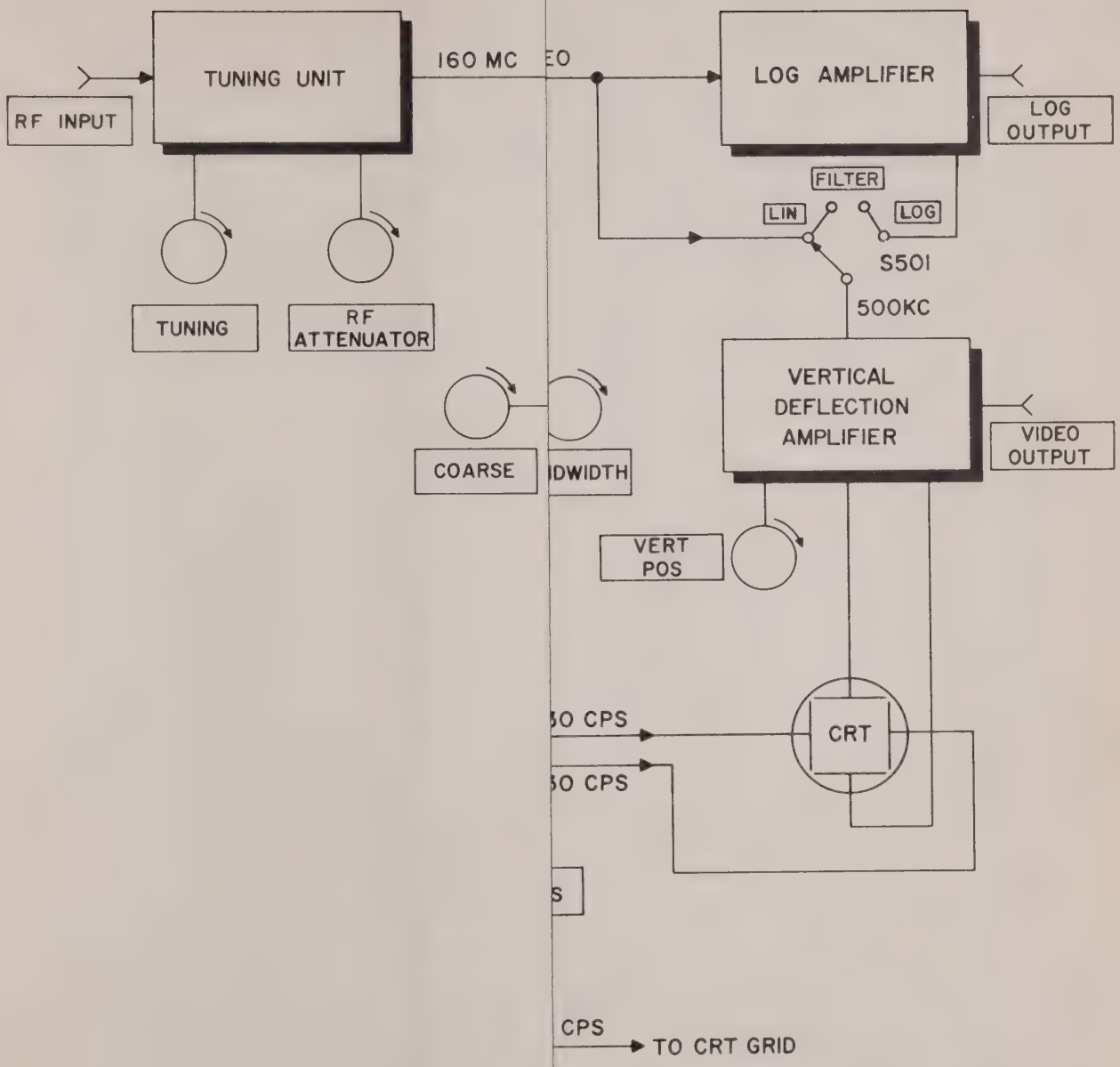
3-16. WIDE-BAND I-F AMPLIFIER, CIRCUIT DESCRIPTION. (See figures 3-2 and 5-2.) The 160-mc center frequency first i-f signal from the first crystal mixer is applied to input jack J701 of the wide-band i-f amplifier via coaxial cable assembly W90. The d-c crystal current is passed through the low-pass filter comprised of inductor L708, capacitors C701 through C704, resistors R701 through R704, and ferrite FE701, terminating at pin H of jack J704.

3-17. The i-f portion of the first crystal mixer output is coupled, through the 160-mc resonant circuit comprised of inductor L719 and capacitor C741, to the cathode of grounded-grid amplifier V701. This i-f stage serves as an impedance matching device, matching the 50-ohm cable impedance to the input impedance of the grounded-grid second stage V702. The output of this grounded-grid stage and the output of the marker oscillator (when the MARKER AMPLITUDE control is rotated clockwise from its OFF position) are then applied to the control grid (pin 7) of i-f amplifier V702,3. The stagger-damped cascode amplifier, V702, has a center frequency of 160 mc and a bandwidth of 80 mc. The amplified output of V702 is taken across variable inductor L704 and coupled to the grid of V703. Amplifiers V703 and V704 are similar to V702 in operation. They are both stagger-damped cascode amplifiers, providing adequate gain over the 80-mc bandwidth of the wide-band i-f amplifier.

3-18. SWEEP-FREQUENCY GENERATOR, CIRCUIT DESCRIPTION. (See figures 3-2 and 5-2.) The sweep-frequency generator serves the dual function of generating a swept frequency whose center frequency is 224 mc and heterodyning this swept signal with the 160-mc output of the wide-band i-f amplifier. The amount of sweep (or deviation) from the 224-mc center frequency is determined by the amplitude of the sawtooth voltage obtained from the video chassis. Coarse adjustment of this sawtooth voltage is accomplished by DISPERSION HIGH-LOW switch S502 and fine adjustment by the DISPERSION control R538.

3-19. The sweep-voltage output of the video amplifier is coupled, via jack J501, coaxial cable assembly W85, and jack J402, to the control grid of d-c amplifier V403. The center frequency of the oscillators is controlled by the CENTER FREQUENCY COARSE-FINE controls. These controls provide a DC voltage which is added to the sawtooth signal present at the grid of V403. The current sawtooth applied to reactor L402 causes a flux change in the gap of its laminations. In this gap ferrite cores are placed on which L405 and L407 are wound. The change in flux varies the permeability of the cores which causes the inductance of L405 and L407 to vary. This produces a frequency change in the oscillators. To compensate for the slight non-linearity of the circuit an additional DC bias current is applied to the reactor L402,3, controlled by R403.

3-20. When the DISPERSION HIGH-LOW switch is in the HIGH position, the high dispersion




ck Diagram, Model TSA-W

3-12. POWER SUPPLIES. Four electronically regulated power supplies are employed to obtain the dc voltages necessary for the operation of the Model TSA-W. The -1250 and -325 volt supply provides the operating voltages necessary for the operation of the klystron. The other three supplies, the -150, the +125, and the +300 volt supplies provide the necessary plate and biasing voltages for the operation of the rest of the TSA-W and tuning unit.

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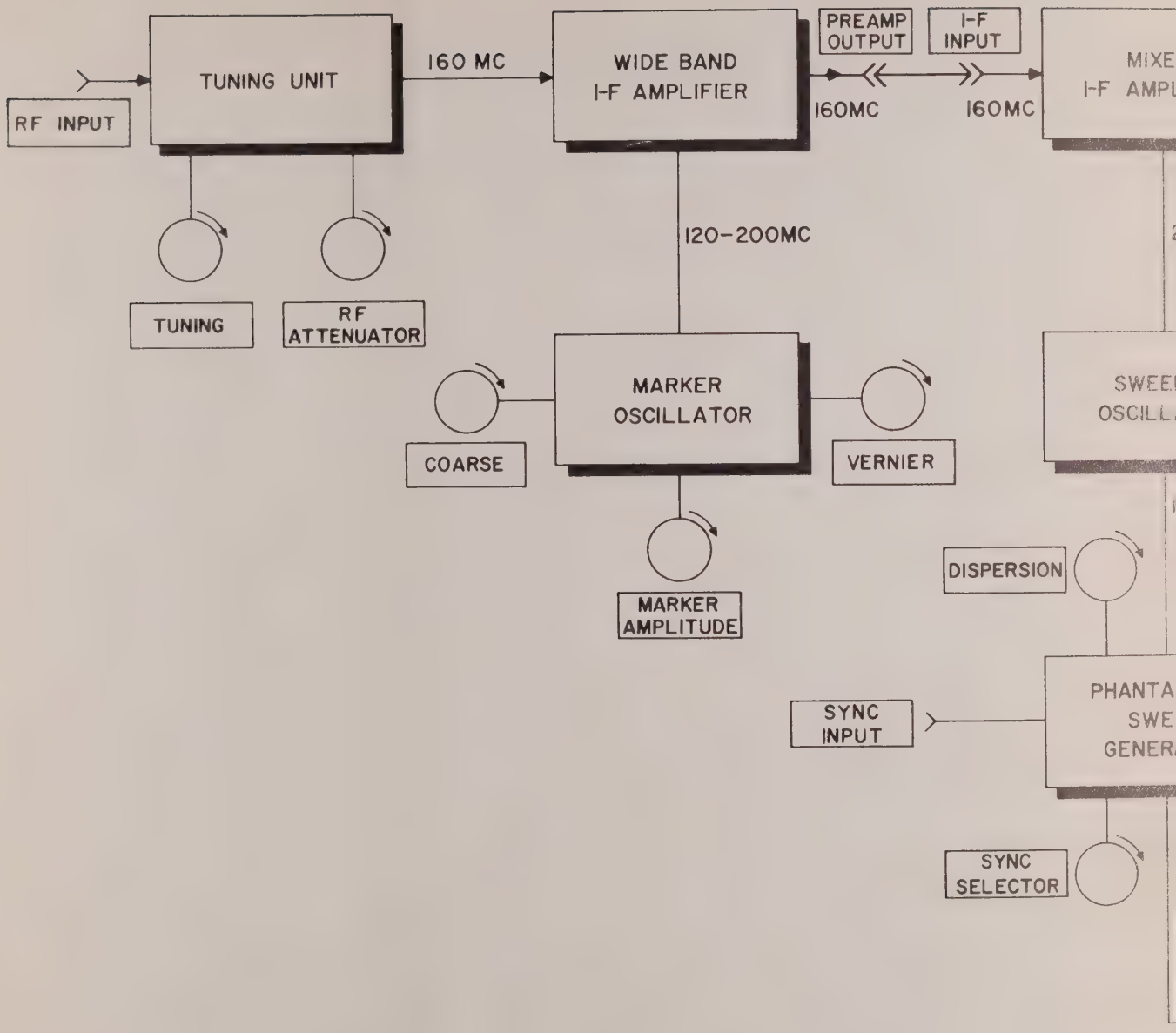
3-20. When the DISPERSION HIGH-LOW switch is in the HIGH position, the high dispersion


RF INPUT
TUNING UNIT
160 MC
WIDE BAND
I-F AMPLIFIER
PREAMP
OUTPUT
I-F
INPUT
160MC
160MC
MIXE
I-F AMPL
TUNING
RF
ATTENUATOR
120-200MC
MARKER
OSCILLATOR
COARSE
VERNIER
SWEE
OSCILL
DISPERSION
MARKER
AMPLITUDE
SYNC
INPUT
PHANTA
SWE
GENER
SYNC
SELECTOR

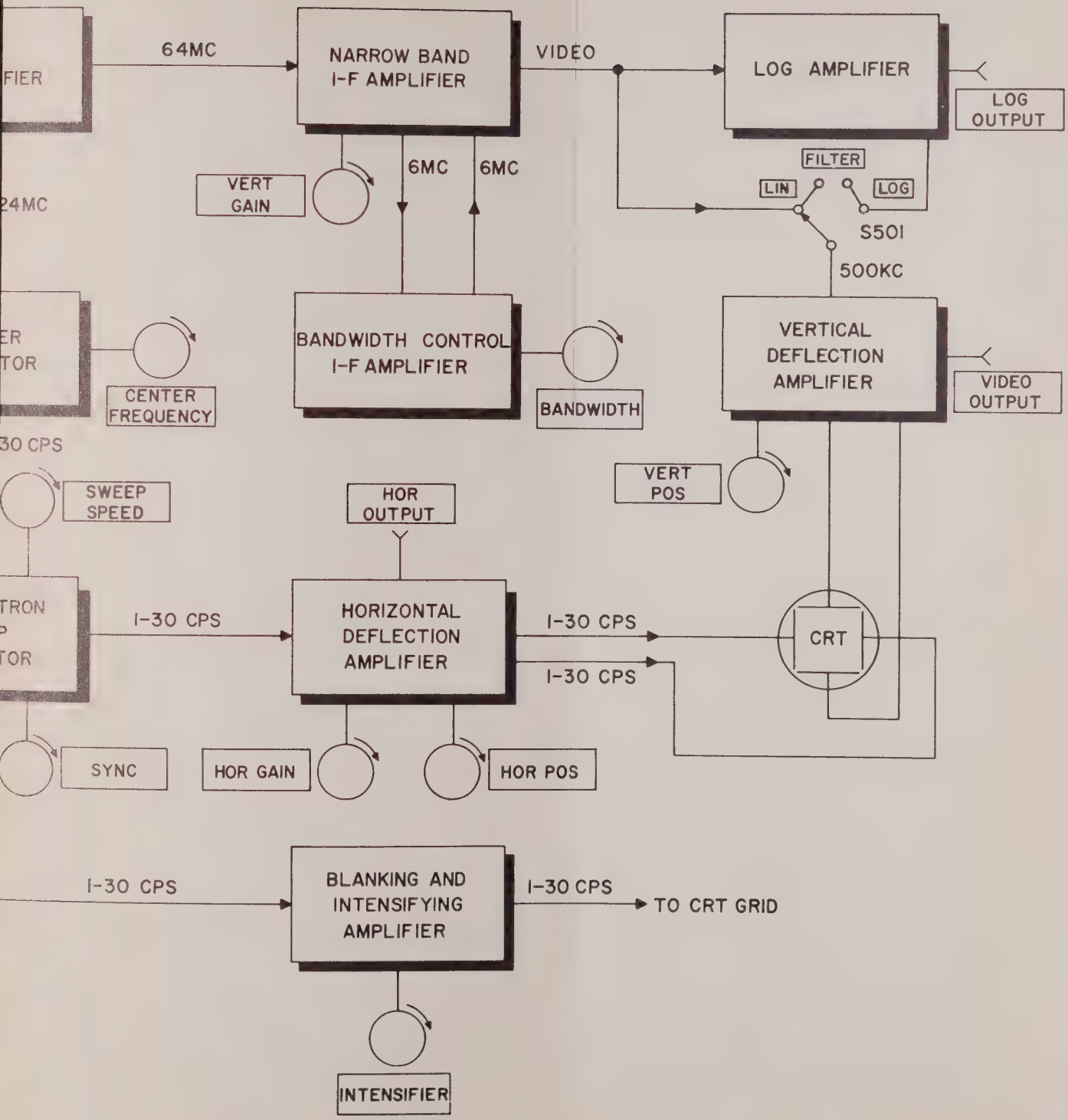
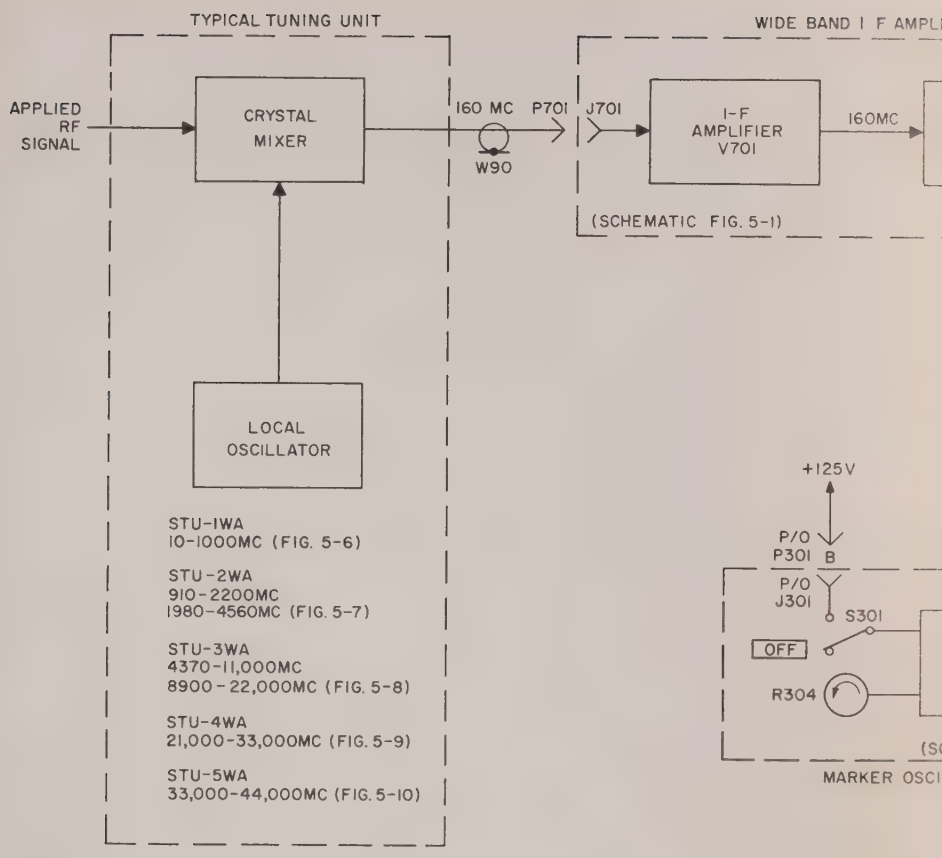
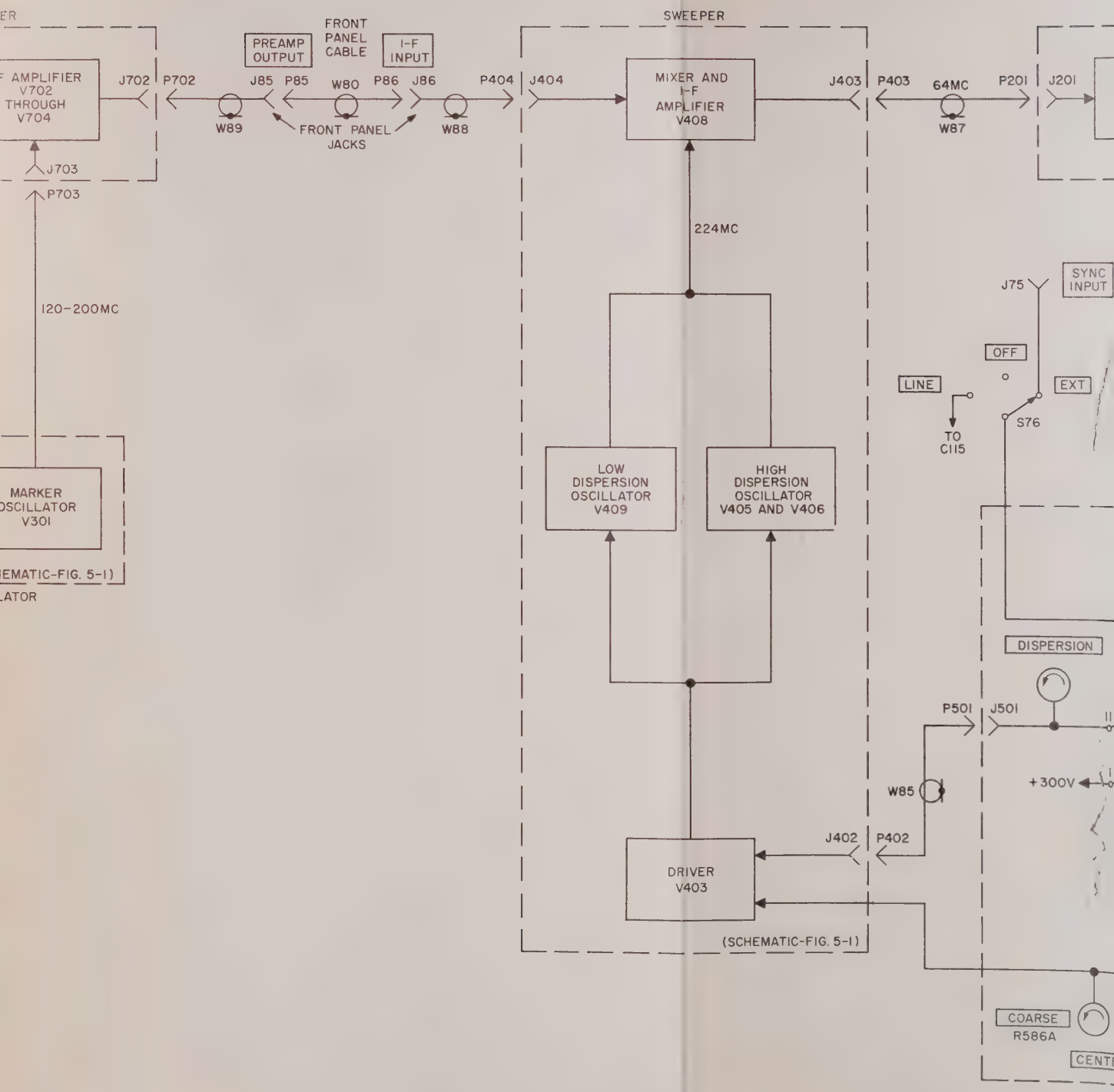
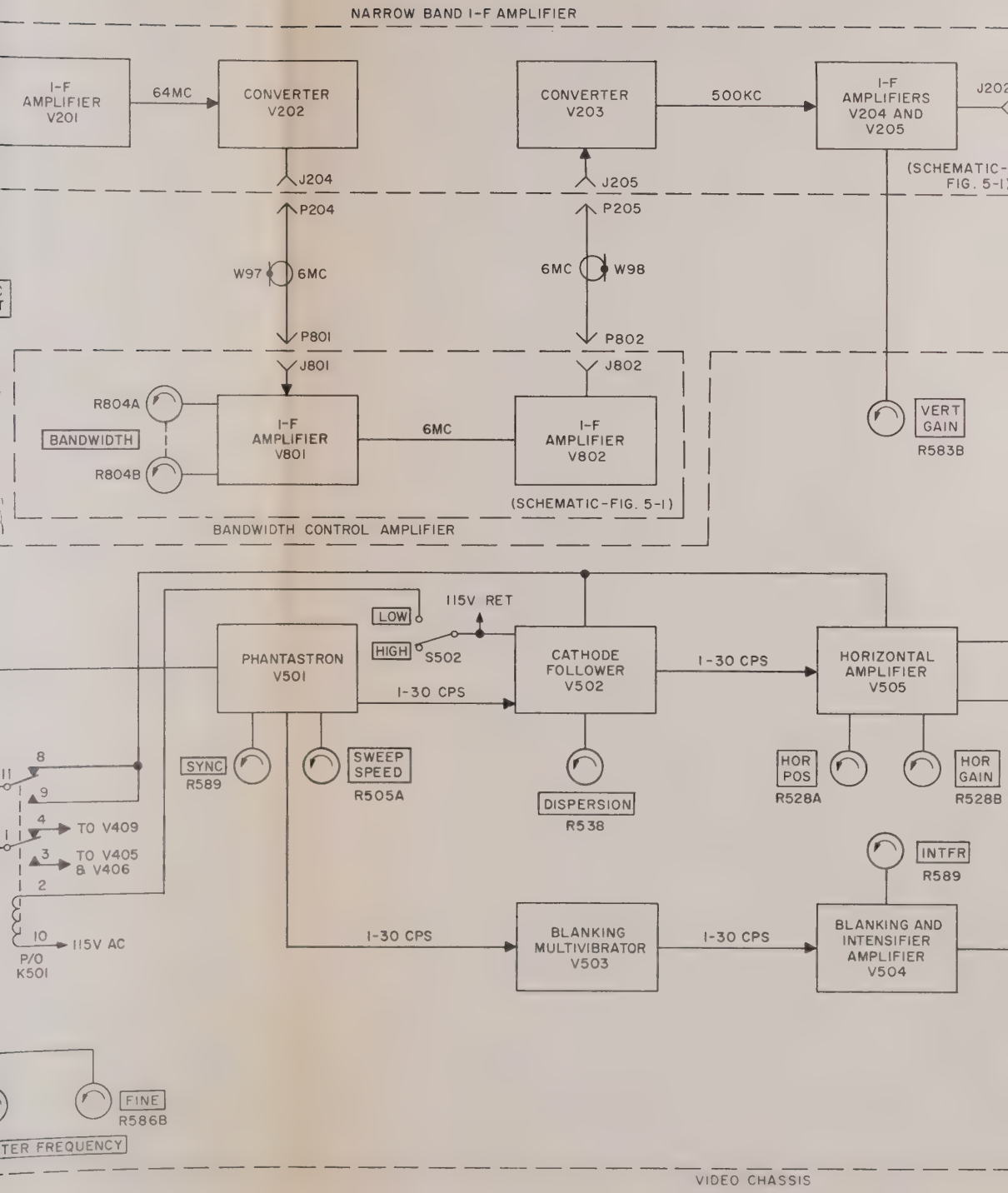


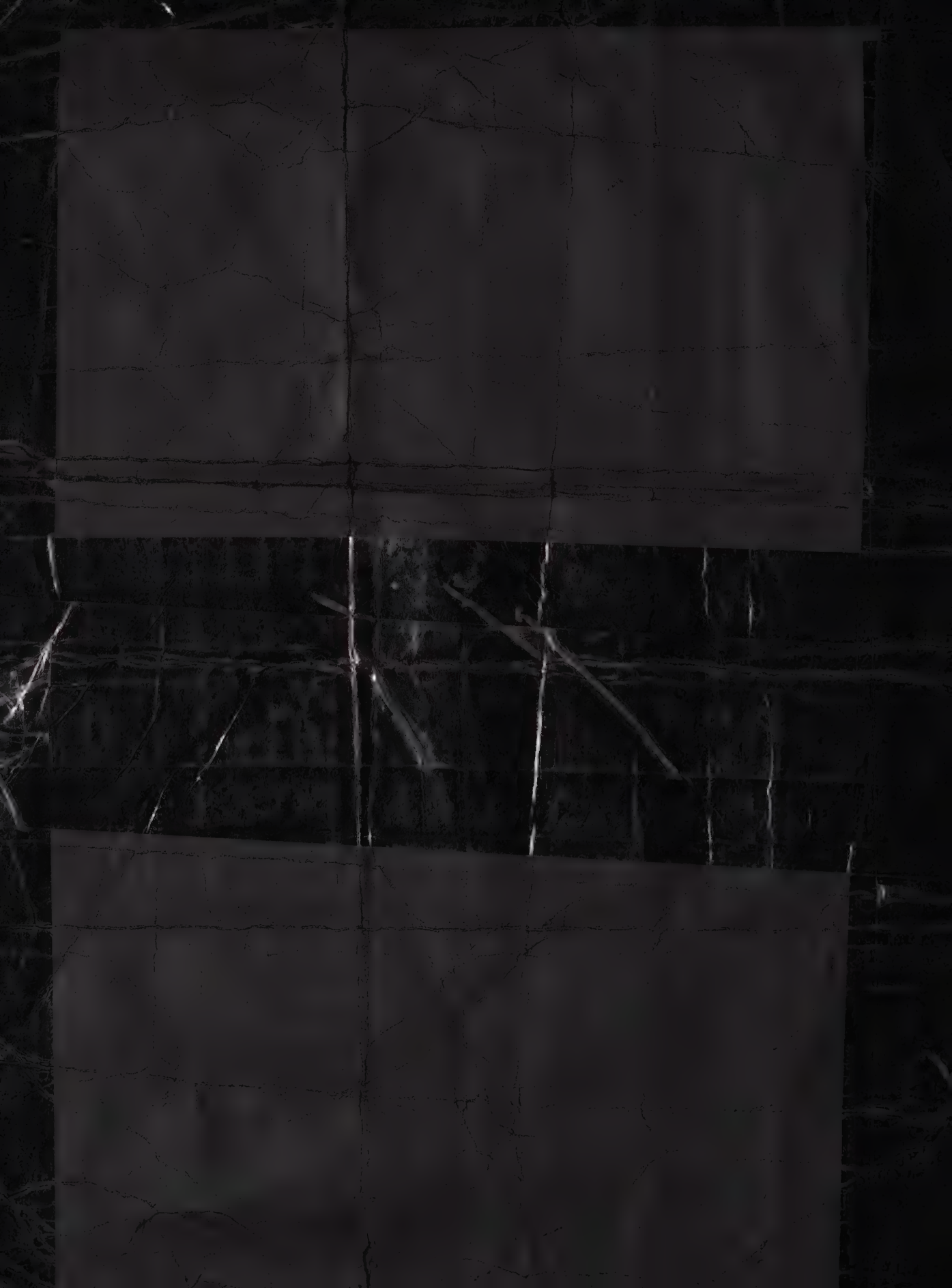

Figure 3-1. Simplified Block Diagram, Model TSA-W

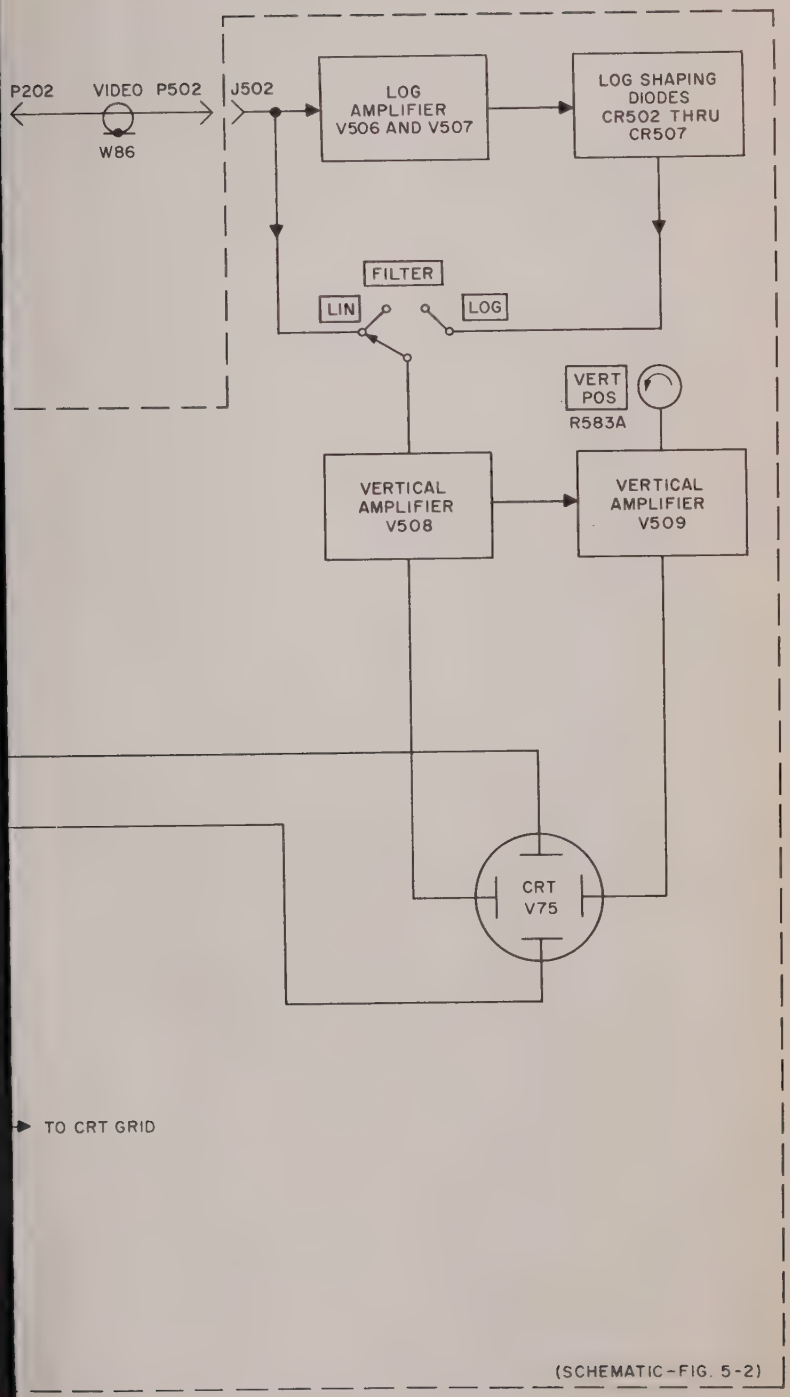

TYPICAL TUNING UNIT
WIDE BAND I F AMPLI
APPLIED RF SIGNAL
CRYSTAL MIXER
160 MC
P701
W90
J701
I-F AMPLIFIER V701
160MC
(SCHEMATIC FIG. 5-1)
LOCAL OSCILLATOR
STU-1WA
10-1000MC (FIG. 5-6)
STU-2WA
910-2200MC
1980-4560MC (FIG. 5-7)
STU-3WA
4370-11,000MC
8900-22,000MC (FIG. 5-8)
STU-4WA
21,000-33,000MC (FIG. 5-9)
STU-5WA
33,000-44,000MC (FIG. 5-10)
+125V
P/O P301 B
P/O J301
S301
OFF
R304
MARKER OSCI


ER
F AMPLIFIER V702 THROUGH V704
J702
P702
PREAMP OUTPUT
FRONT PANEL CABLE
I-F INPUT
J85
P85
W80
P86
J86
P404
J404
W89
FRONT PANEL JACKS
W88
J703
P703
120-200MC
MARKER OSCILLATOR V301
EMATIC-FIG. 5-1)
LATOR
SWEEPER
MIXER AND I-F AMPLIFIER V408
J403
P403
64MC
W87
P201
J201
224MC
LOW DISPERSION OSCILLATOR V409
HIGH DISPERSION OSCILLATOR V405 AND V406
DRIVER V403
J402
P402
(SCHEMATIC-FIG. 5-1)
J75
SYNC INPUT
OFF
LINE
EXT
S76
TO C115
DISPERSION
P501
J501
W85
+300V
COARSE R586A
CENT


NARROW BAND I-F AMPLIFIER
I-F AMPLIFIER V201
64MC
CONVERTER V202
CONVERTER V203
500KC
I-F AMPLIFIERS V204 AND V205
J204
J205
P204
P205
W97
6MC
6MC
W98
P801
P802
J801
J802
R804A
BANDWIDTH
R804B
I-F AMPLIFIER V801
6MC
I-F AMPLIFIER V802
(SCHEMATIC-FIG. 5-1)
BANDWIDTH CONTROL AMPLIFIER
VERT GAIN
R583B
LOW
HIGH
S502
115V RET
PHANTASTRON V501
1-30 CPS
1-30 CPS
CATHODE FOLLOWER V502
HORIZONTAL AMPLIFIER V505
SYNC
R589
SWEEP SPEED
R505A
DISPERSION
R538
HOR POS
R528A
HOR GAIN
R528B
8
9
4
TO V409
3
TO V405 & V406
2
10
115V AC
P/O K501
INTFR
R589
1-30 CPS
BLANKING MULTIVIBRATOR V503
1-30 CPS
BLANKING AND INTENSIFIER AMPLIFIER V504
FINE
R586B
TER FREQUENCY
VIDEO CHASSIS

Figur






e 3-2. Detailed Block Diagram

swept-frequency local oscillator is energized, producing a signal whose frequency is swept between the limits of 184 mc and 264 mc (center frequency of 224 mc). This signal is coupled to second crystal mixer CR402, which heterodynes it with the 160-mc output of the wide-band i-f amplifier, producing the second i-f signal centered at 64 mc.

3-21. When the DISPERSION, HIGH-LOW switch is in the LOW position, the low dispersion swept-frequency local oscillator is energized, producing a signal whose frequency is swept between the limits of 219 mc and 229 mc (the center frequency again being 224 mc). In both cases (HIGH or LOW position of the DISPERSION HIGH-LOW switch) the frequency excursion of the local oscillators specified is for full clockwise rotation of the DISPERSION control. The excursion is reduced when the control is adjusted to any other position other than fully clockwise.

3-22. The second intermediate frequency signal produced in second crystal mixer CR402 is transformer coupled (via L408, which is tuned to 64 mc) to the control grid of i-f amplifier V408. The output of this stage is transformer coupled (via L409, which is also tuned to 64 mc) to the input jack of the narrow band i-f amplifier (via J403 and coaxial cable assembly W87).

3-23. NARROW-BAND I-F AMPLIFIER, CIRCUIT DESCRIPTION. (See figures 3-2 and 5-3.) The narrow-band i-f amplifier serves the triple purpose of amplifying the second i-f signal, converting the second i-f signal first to 6 mc (third i-f) and then to the final i-f frequency of 500 kc, and detecting the fourth i-f signal. The video information is then applied to the video amplifier. The 64-mc output of the wide-band i-f amplifier is applied to the primary of transformer T201, which is tuned to 64 mc. The signal appearing at the secondary is coupled to the control grid of i-f amplifier V201. The output of this amplifier is taken across the parallel resonant tank circuit comprised of variable inductor L202 (which is tuned to 64 mc) and capacitor C205, and is coupled to the third grid (pin 7) of converter V202.

3-24. The local oscillator section of the pentagrid converter, V202, is controlled by crystal Y201. This crystal is connected between the control grid (pin 1) and the second and fourth grids (pin 6). The second and fourth grids act as the tuned plate and the control grid as the grid of a 58-mc triode oscillator. The oscillator output is coupled through the electron stream to modulate the incoming 64-mc signal. The plate load, consisting of variable inductor L223 (and the associated stray capacitance) is tuned to 6 mc, passing the 6-mc signal resulting from the second harmonic of crystal Y201 and the 64-mc second i-f. This third i-f signal of 6 mc is coupled, via J204 to the variable bandwidth i-f control amplifier, which provides a means of adjusting the bandwidth of the third i-f signal.

3-25. The output of the variable bandwidth i-f control amplifier is returned to the narrow-band i-f amplifier, via J205, and is coupled to the third grid (pin 7) of V203, a pentagrid converter. The second and fourth grids act as the plate and the control grid is the grid of 6. 5-mc triode oscillator. The oscillator output is coupled through the electron stream to modulate the incoming 6-mc signal. The plate load, consisting of variable inductor L209 (which is tuned to 500 Kc) and capacitor C221, passes the 500 kc fourth i-f signal to the control grid of i-f amplifier V204.

3-26. I-f amplifiers V204 and V205, in cascade, amplify the 500-kc signal to a level sufficient to provide a demodulated signal capable of fully driving the vertical amplifiers. The output of V205 is coupled to detector CR201, which rectifies the fourth i-f signal. The detected signal is then coupled to the video amplifier via J202 and coaxial cable assembly W86.

3-27. The over-all gain of the narrow-band i-f amplifier is controlled by VERT GAIN control R583B (located in the video chassis). Rotation of this control adjusts the d-c potential applied to the cathodes of i-f amplifiers V201 and V204, thus determining the gain of these stages.

3-28. VARIABLE BANDWIDTH I-F CONTROL AMPLIFIER, CIRCUIT DESCRIPTION. (See figures 3-2 and 5-3.) The variable bandwidth i-f control amplifier serves to adjust the final resolution bandwidth of the i-f signal within the range from 1 to 80 kc. The control amplifier is basically two crystal filter stages (V801A and V801B) and an amplifier stage (V802).

3-29. The first crystal filter stage is basically a bridge configuration with the arms being R802, R803, C802, and Y801. The output is developed across T801. The bandwidth, when coupled through Y801, is very narrow because the crystal is effectively an extremely high Q resonant circuit. The bandwidth, when coupled through C802, results in the response of the normal LC resonant circuit. When the BANDWIDTH control R804B is at its extreme counterclockwise (shorted) position, the output signal across T801 is produced only by the coupling through Y801 which results in an extremely narrow-band signal. Conversely, when R804B is at its extreme clockwise position (effectively open) the output signal is produced by the broadband coupling through C802. The second stage operates in the same manner. Combined, they control the i-f bandwidth over an extremely large range.

3-30. The output of V801B is the amplified V802. The output of this stage is coupled (via J802) back to the narrow-band i-f amplifier.

3-31. VIDEO CHASSIS, CIRCUIT DESCRIPTION. (See figures 3-2 and 5-2.) The video chassis serves to generate the necessary sweep voltages required for the presentation of the video information on the screen of the cathode-ray display tube. It also amplifies the information to be displayed, and generates an intensifying and blanking potential which is applied to the control grid of the crt.

3-32. Log Shaping Circuit. A logarithmic display of the applied signal amplitude is presented on the CRT screen after flowing through a diode segmentation circuit which operates as follows:

a. The output of the narrow-band i-f amplifier is applied to the video amplifier via coaxial cable assembly W86 and jack J502. The detected 500-kc video signal appears at both the control grid of log amplifier V506 and the LIN contact of LOG-FILTER-LIN switch S501A.

b. When the LOG-FILTER-LIN switch is in the LOG position, the incoming video signal is amplified by log amplifier V506. The output of this stage is coupled to the pentagrid control grid pin 8, of log amplifier V507 for further amplification. The output of V507 is then applied to the triode control grid pin 2, of V507, which is a cathode follower. The signal is then applied to the diode segmentation circuit comprised of crystal diodes CR502 through CR507 and their associated resistors. Due to the biasing resistors connected to the diodes, each diode conducts at a signal voltage greater than the previous one. In this manner, the voltage drop across resistor R559 causes the output (which appears at S501A) to approach the log of the applied signal voltage.

3-33. The output of the log-circuit (when the LOG-FILTER-LIN switch is in the LOG position) or the output of the narrow-band i-f amplifier (when the LOG-FILTER-LIN switch is in the LIN position) is coupled to the control grid of vertical amplifier V508. When the LOG-FILTER-LIN switch is in one of the FILTER positions the video frequency response is reduced by the addition of C516. This suppresses the unwanted beat frequencies that are normally produced when comparing two signals separated by a very small frequency difference. V508 and V509 operate as cathode-coupled push-pull balanced deflection amplifiers. The use of balanced amplifiers insures proper linearity and minimum distortion of the displayed video information. The vertical positioning of the display is adjusted by VERT POS control R583A. The video output of the vertical amplifiers is directly coupled to the vertical deflection plates of the cathode-ray tube through pins A and B of mating connectors J504 and P504. Direct coupling provides a two-fold advantage; it permits broadband frequency response down to d-c; at the same time, it permits instantaneous trace positioning.

3-34. Sawtooth Generator. The function of the sawtooth generator is to provide the timing reference voltage for the horizontal amplifier V505, blanking multivibrator V503, and the sweep-frequency generator. This sawtooth voltage repetition rate is adjustable over the range from 1 to 30 cps by means of SWEEP SPEED control R505. Synchronization with the internal power line frequency may be set with SYNC control R76.

3-35. The sawtooth generator is comprised of phantastron V501 and cathode follower V502, which combine to form a free-running screen coupled phantastron sawtooth voltage generator. Phantastron V501 employs a pentode with two control grids. The suppressor grid has a sharp cutoff characteristic, and is used as an independent control element. Initially, the screen grid (pin 6) is conducting heavily, while the suppressor grid (pin 7) is effectively cutting off the plate (pin 5) current. (See A, B, and C of figure 3-3.) The instantaneous plate voltage (figure 3-3B) is at its maximum value. At the same time, the control grid (figure 3-3D) is at zero bias due to the positive voltage return of grid resistors R504 and R505A in series. The presence of any transient negative pulse at the plate of V501 is fed back to the control grid of V501 via cathode follower V502. This action causes the screen current to fall, resulting in a simultaneous rise in screen voltage (figure 3-3C). This voltage change is coupled to the suppressor grid (pin 7) through C504, causing the suppressor grid to initiate and maintain the plate current. The plate current now rises (with the plate voltage dropping) at a rate determined by the RC time constant of the grid circuit (C503, R504, and R505A). Waveform linearity is obtained by feedback between the plate and grid (pin 1). This feedback tends to maintain a constant current through the grid capacitor. The rise in plate current (and fall in plate voltage) continues until the plate bottoms and the tube saturates. At this point (figure 3-3A) the control grid voltage reverts to its normal zero bias condition, causing the screen and suppressor potentials to be restored to their original values. The plate current now starts to fall (plate voltage rises) until the plate voltage reaches +125 volts. The presence of a synchronizing voltage at the suppressor grid insures a constant sawtooth rate, determined by the setting of SWEEP SPEED control R505A.

3-36. Horizontal Amplifier. The sawtooth voltage output of cathode follower V502 pin 3 is applied to the control grid (pin 2) of horizontal amplifier V505 (through HOR GAIN control R528B). V505 is a twin-triode amplifier functioning as a cathode-coupled push-pull balanced amplifier. The sawtooth voltage is applied to the horizontal deflection plates of cathode-ray tube V75. The use of balanced amplifiers insures proper linearity and minimum distortion of the horizontal sweep voltage. Horizontal positioning of the trace is effected by means of HOR POS control R528A. The horizontal output of V505 is directly coupled, via pins C and D of connectors J504 and P504, to the cathode-ray tube, thus assuring linear operation at low sweep speeds.

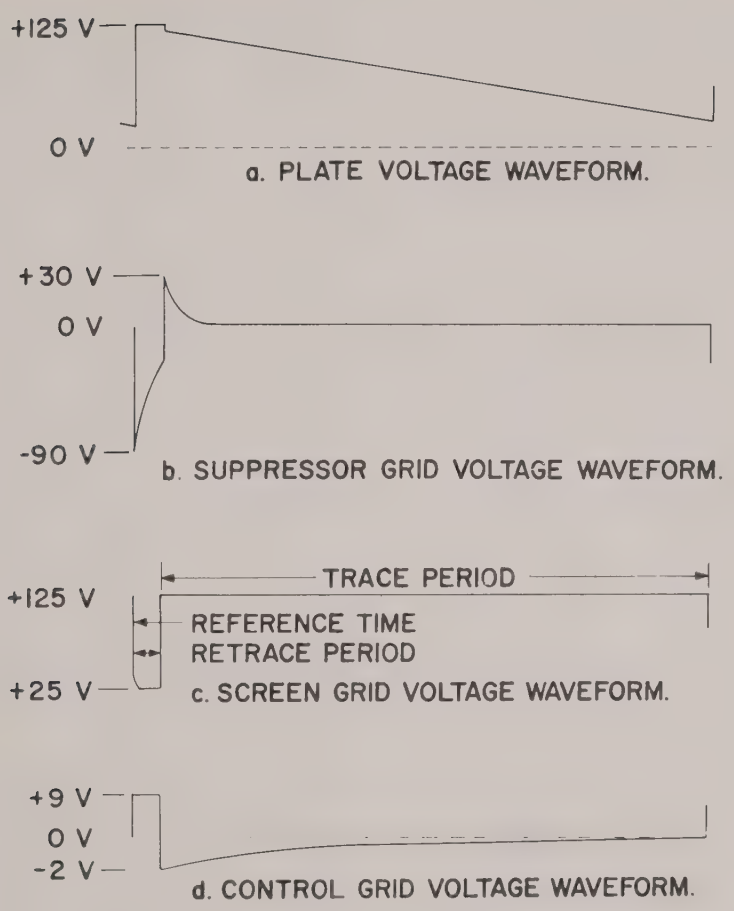



Figure 3-3. Sawtooth Generator Voltage Waveforms

3-37. Blanking Multivibrator. A portion of the output of the sawtooth generator, which consists of a pulse developed at the screen grid of phantastron V501, is coupled to the control grid (pin 7) of blanking multivibrator V503 through crystal CR501. The polarity of CR501 is such that only negative going pulses are passed to the grid. This negative-going pulse triggers V503, which functions as a one-shot cathode-coupled multivibrator. The negative going pulse corresponds to the start of the retrace period. For proper blanking, the width of this pulse must be adjusted to correspond to the retrace period. This is automatically accomplished by the ganged connection of R505B to the SWEEP SPEED control R505A. R515 is factory pre-set to adjust the tracking of R505B with R505A. The amplified output of the blanking multivibrator is coupled to the control grid, pin 2, V504.

3-38. Blanking And Intensifier Amplifier. The output of V503 is applied to the control grid (pin 2) of V504, where the signal is amplified and inverted. The inverted signal, which is of negative polarity, is applied to the control grid of the cathode-ray tube, blanking the display on the retrace portion of the display.

3-39. The output of vertical amplifier V508 is also coupled to the control grid pin 7 of V504. During those portions of the trace period when video information is being amplified by the vertical amplifier, the negative signal appearing at the plate of V508 is coupled to the control grid pin 7, of V504. This signal is amplified and inverted, and then applied to the control grid of the cathode-ray tube. In this manner, the displayed video information is amplified while

the base line intensity remains unchanged. Both the blanking and intensifier signals are available at the plate (pin 6) of V504.

3-40. TUNING UNIT CRYSTAL MIXER. (See figure 5-6 through 5-10.) The tuning unit crystal mixer consists of a silicon diode which mixes the incoming signal with the local oscillator signal to produce the 160 mc first i-f frequency. The crystal has non-linear characteristics, and as a result when the tuning units are being operated on their high frequency bands, the second harmonic of the local oscillator is mixed with the incoming signal to produce the 160 mc i-f frequency.

3-41. MARKER OSCILLATOR. (See figure 5-1.) The marker oscillator V301 is connected as a high frequency Colpitts oscillator tuned to a frequency of 160 mc. Two controls determine the operating frequency of the marker oscillator. The VERNIER control, variable capacitor C312, allows a fine adjustment of the marker oscillator frequency. The COARSE control, variable capacitor C302, allows a coarse adjustment of the marker oscillator frequency. When the FREQUENCY DIFFERENCE MC dial is set at zero by adjusting the VERNIER and COARSE controls, the marker oscillator operates at a frequency of 160 mc. This 160 mc output is fed to the wide band i-f. However, if the FREQUENCY DIFFERENCE MC dial is set to a reading other than zero the marker oscillator is tuned that much away from 160 mc. For example, if the FREQUENCY DIFFERENCE MC dial is set to -10 mc the marker oscillator will be tuned to 170 mc. In this case the marker pip will not appear in the center of the display, it will be displaced by 10 mc from the center. Thus, by varying the VERNIER and COARSE controls, the frequency at any point on the display is separated from the 160 mc first i-f frequency. It may then be measured and the frequency difference in megacycles read directly from the FREQUENCY DIFFERENCE MC dial. In addition to the frequency difference scale there is also pulse width calibration. The calibration is in terms of pulse-width of rectangular pulses. To use it, both COARSE and VERNIER dials are set to zero and the signal is tuned in using the main tuning dial to line up the first significant point of the spectrum (usually a zero or the peak of the main lobe). The marker is then tuned to the next significant point and the pulse width is read directly off the dial. The MARKER AMPLITUDE control potentiometer R304 varies the amplitude of the marker signal fed to the wide band i-f amplifier. This varies the size of the pip produced on the display and allows for setting the pip to a convenient height.

## 3-42. POWER DISTRIBUTION.

3-43. Power for the Model TSA-W Spectrum Analyzer is obtained from one unregulated and four regulated supplies. The unregulated supply furnishes the filament voltages, both AC and DC, while the regulated supplies produce the necessary DC voltages that are applied to the TSA-W.

3-44. To facilitate an understanding of power distribution in the TSA-W, reference should be made to figure 3-4. When power is initially applied to the unit, the tube filaments are energized. After a sixty-second warmup period, time-delay relay, K101, operates and the regulated DC voltages are applied to all the sub-chassis in the display unit, in the following sequence:

a. The klystron power supply provides power for the tuning units.

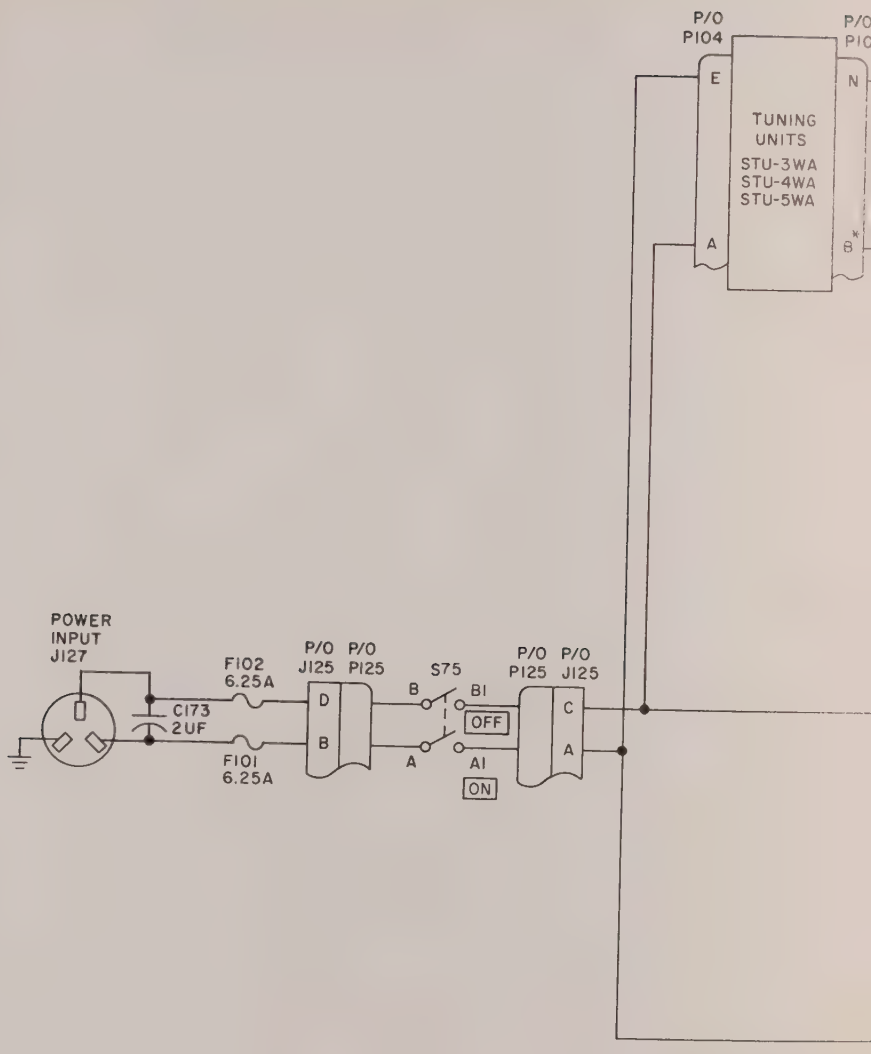
b. The +300 volt supply furnishes power for the Sweep Frequency Generator, the Video Amplifier and the CRT Power Supply.

c. The +125 volt supply furnishes power for the Wide-Band & Narrow-Band I-F Amplifiers, the Variable Bandwidth I-F Control Amplifier and the Marker Oscillator.

d. The -150 volt supply furnishes the bias voltages for the Video Amplifier.

3-45. Paragraphs 3-46 through 3-49 describe the circuitry of each regulated power supply. They should be used in conjunction with the Power Distribution Diagram, Figure 3-4.

3-46. KLYSTRON POWER SUPPLY. (See figure 5-3.) The klystron power supply is a conventional series regulated supply consisting of full wave rectifiers V101 and V102, series regulators V103 and V104, dc amplifier V105, and voltage regulators V106 through V110. The anode volts adjustment (R123) is set to produce a voltage of minus 1,250 volts when using the STU-3WA, STU-4WA or STU-5WA. The setting of the anode volts control determines the value of the bias applied to the control grid of dc amplifier V105. Any change in the minus 1,250 volts supplied to the klystron anode because of changes in loading causes a like change in the bias applied to the control grid of V105. Changing the bias of V105 changes the current flowing in the plate circuit which in turn changes the bias applied to the grids of series regulators V104 and V103. Changing the bias on V103 and V104 changes their plate resistance. Since this plate resistance is in series with the voltage divider the voltage applied to the klystron anode will change. The polarity of the voltage is such that a decrease in klystron anode voltage causes a decrease in plate resistance of the series regulators which causes the klystron voltage to return to normal. Voltage regulator V106 provides the necessary reference voltages for the operation of the regulator circuit. The reflector voltage is developed across V107 through V110. The -325 volt adjustment is made when using the STU-2WA after the anode voltage adjustment has been set and it is kept constant by the same method as described for the


P/O
P104
E
A
TUNING
UNITS
STU-3WA
STU-4WA
STU-5WA
N
B*
POWER
INPUT
J127
C173
2UF
F102
6.25A
F101
6.25A
P/O
J125
P/O
P125
D
B
S75
B
A
B1
OFF
A1
ON
P/O
P125
P/O
J125
C
A

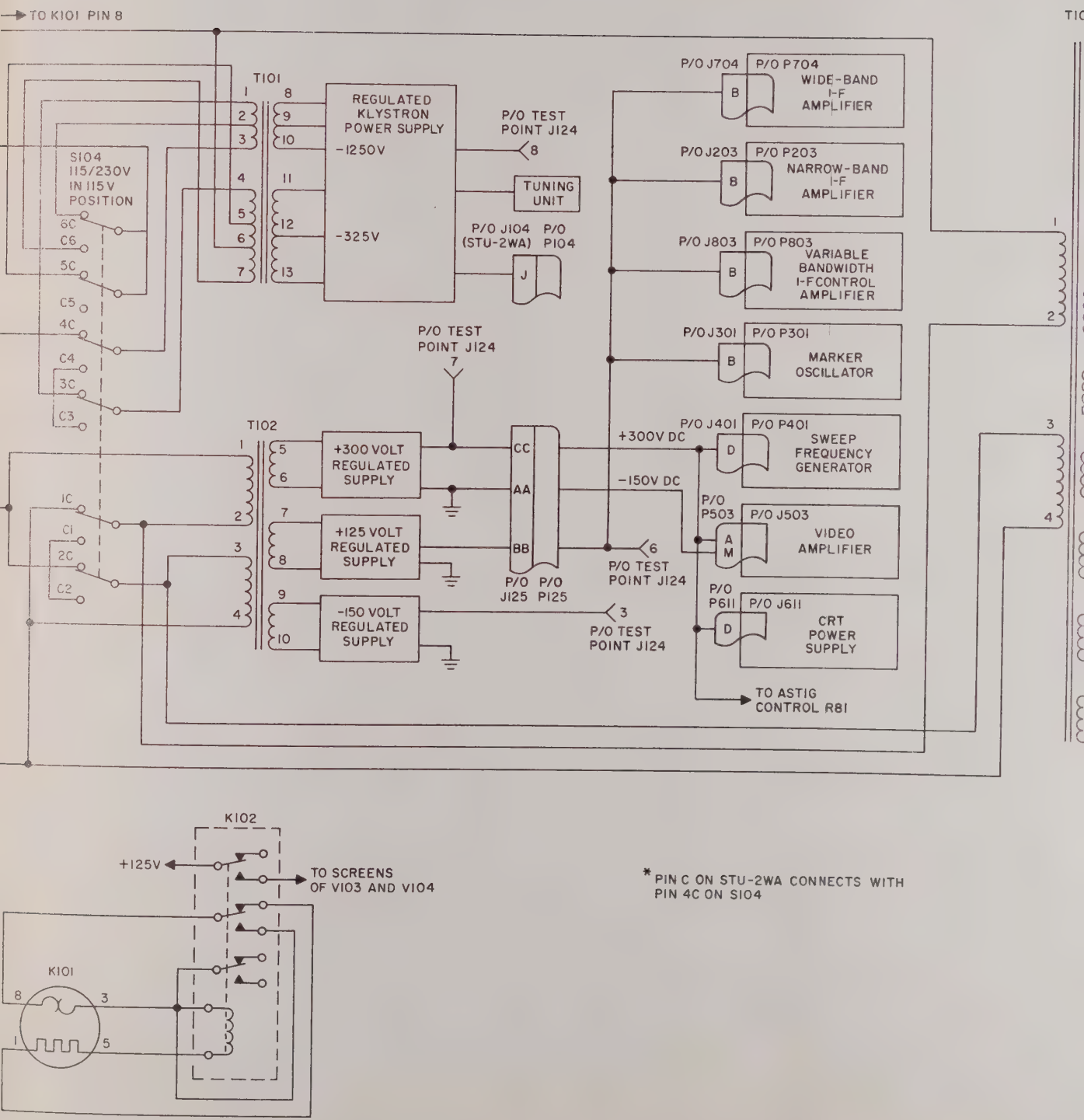
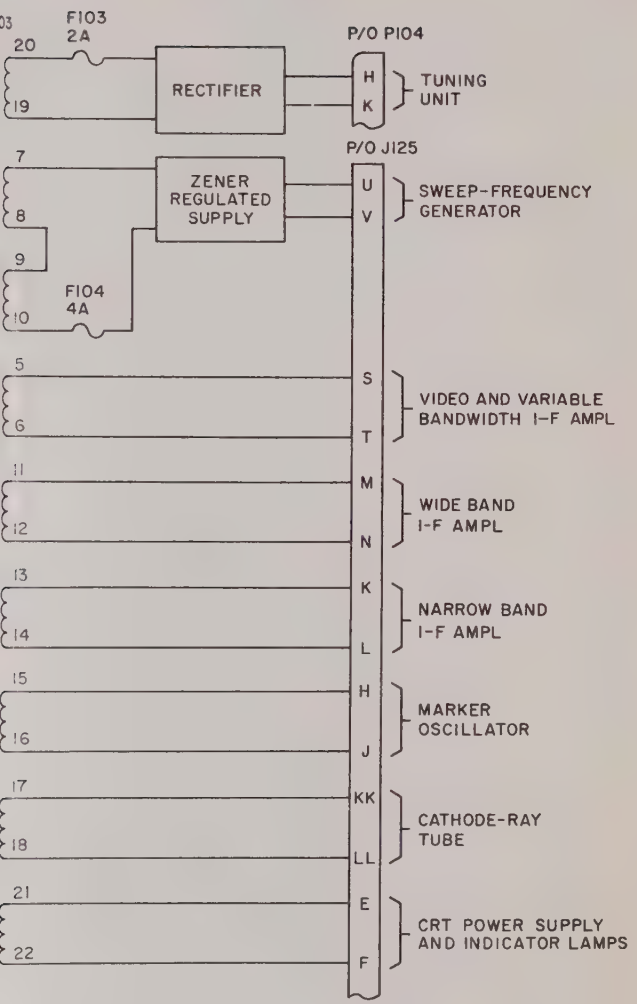



Figure 3-4. Power Di




Distribution Diagram

anode voltage. When tuning units STU-3WA, STU-4WA, or STU-5WA are utilized, an internal jumper in the tuning unit automatically applies a-c power to the proper winding of T101 so that -1,250 volts is supplied to the klystron. However, when tuning unit STU-2WA is used, jumpers and resistors automatically convert the power supply for -325 volts operation.

3-47. +300 VOLT SUPPLY. (See figure 5-3.) The +300 volt supply is a conventional series-type degenerative voltage regulator consisting of series regulators V113 and 1/2 of V111 and DC amplifier V116. The bias on the grid of DC amplifier V116 is adjusted by the +300 V Adjust control R143 to such a value that the voltage appearing at the plate (pin 1) of that tube is the bias voltage for the control grids of series regulators V113 and V111 (pin 1) necessary to obtain the desired +300 volt output of the supply. Variations in the +300 volt supply output voltage due to fluctuations in the load current or power line voltage are amplified by DC amplifier V116. The voltage change at the plate (pin 1) adjusts the bias voltage applied to the grids of series regulators V113 and V111 (pin 1), which returns the output level of the supply to the required +300 volts.

3-48. +125 VOLT SUPPLY. (See figure 5-3.) The +125 volt supply is a conventional series-type degenerative voltage regulator consisting of series regulators V114 and 1/2 V111 and DC amplifier V117. The bias on the grid of DC amplifier V117 is adjusted by the +125 V Adjust control R147 to such a value that the voltage appearing at the plate (pin 1) of that tube is the bias voltage for the control grids of series regulators V114 and V111 (pin 4) necessary to obtain the desired +125 volt output of the supply. Variations in the +125 volt supply output voltage due to fluctuations in the load current or power line voltage are amplified by DC amplifier V117. The voltage change at the plate (pin 1) adjusts the bias voltage applied to the grids of series regulators V114 and V111 (pin 4), which returns the output level of the supply to the desired +125 volts.

3-49. -150 VOLT SUPPLY. (See figure 5-3.) The -150 volt supply is a conventional series-type degenerative voltage regulator consisting of series regulator V112, voltage regulator V118, and DC amplifier V115. The bias on the grid of DC amplifier V115 is adjusted by the -150 V Adjust control R154 to such a value that the voltage appearing at the plate (pin 1) of that tube is the bias voltage for the control grid of series regulator V112 necessary to obtain the desired -150 volt output of the supply. Variations in the -150 volt supply output voltage due to fluctuations in the load current or power line voltage are amplified by DC amplifier V115. The voltage change appearing at the plate (pin 1) adjusts the bias voltage applied to the grid of series regulator V112, which returns the output level of the supply to the desired -150 volts.

3-50. CRT SUPPLY. (See figure 5-4.) For the high-voltage low-current requirements of the cathode-ray tube, an r-f oscillator high-voltage supply is employed. High-frequency oscillations are developed in the Hartley-type circuit, the frequency of this oscillation being determined by the inductance of the entire primary winding of T603 and the capacitor C621. The output voltage appearing across the secondary of T603 (which is a step-up transformer) is applied to the high-voltage rectifiers V617 and V618, which are connected as a voltage doubler. The output of this network, which produces the +2,400 and -2,400 volts required, is applied to the various accelerating and control grids of cathode-ray tube V75. A discharge resistor is provided across the positive 2,400 volt supply as a means of quickly discharging the high-voltage when power is disconnected. The bleeder network in the negative 2,400 volt supply permits adjustment of the various accelerating and control voltages applied to V75. This circuit arrangement also assures discharge of the high-negative voltage when the power is disconnected.

3-51. The front panel BRIGHTNESS control R78 maintains the control grid of cathode-ray tube V75 at the proper negative potential with respect to the cathode. The front panel FOCUS control R79 adjusts the potential on grids 2 and 4, causing convergence of the electron beam on the screen of the cathode-ray tube. The accelerating anode is connected directly to the +2,400 volt supply.

## 3-52. TUNING UNIT MECHANICAL DRIVE SYSTEM.

3-53. Each of the five tuning units contains a precision UNIDIAL ® drive mechanism for simultaneous tracking of the local oscillator with tuning dial rotation. The precision mechanical drive consists of a main drive shaft and tuning cam which converts the rotational motion imparted by the TUNING control to the transitional motion necessary for varying the position of the contact-type short of the transmission line oscillator, and a non-contacting type short of the external-cavity reflex klystron. In tuning unit models STU-2WA through STU-4WA a second cam is used to actuate a mode switching microswitch. This cam is mounted on the shaft of the reflector tracking potentiometer which is driven by the main drive shaft via an idler gear. Tuning unit model STU-5WA does not require mode switching since single mode operation of the cavity covers the entire frequency range of the unit. In this case only the tracking potentiometer is driven by the main drive shaft via the idler gear.

# SECTION IV

# MAINTENANCE

## 4-1. GENERAL.

4-2. This section contains a list of the test equipment required for maintenance, the minimum performance standards that are used to ascertain equipment capability, the procedures for system and detailed troubleshooting, disassembly and reassembly instructions, alignment and calibration procedures, and lubrication data for the Model TSA-W. Section V, Diagrams, contains schematic, cabling and voltage and resistance diagrams to be used in conjunction with the procedure given in this section. Section VI, Parts List, contains a complete parts list for the Model TSA-W.

## 4-3. TEST EQUIPMENT REQUIRED.

4-4. Table 4-1 lists and describes applications of test equipment required for Model TSA-W maintenance. Test equipment of equivalent characteristics can be substituted for the items listed in the table.

TABLE 4-1. TEST EQUIPMENT REQUIRED

| Test Equipment Name, Model and Manufacturer | Application |
|---|---|
| Volt-ohm-milliammeter multimeter, Model 260, Simpson Electric Co. | Voltage and resistance measurements |
| Oscilloscope, Model 130B, Hewlett-Packard Co. | Checking waveforms and tuning unit |
| Voltmeter, vacuum-tube type, Model WV98A, Radio Corp. of America | Checking voltages at high impedance points |
| RF Signal Generator, Model 65B, Measurements Corp. | Checking narrow band i-f amplifier |
| RF Signal Generator, Model 80, Measurements Corp. | Checking the narrow band amplifier, sweep generator, and marker oscillator |
| Frequency Counter, Model 524, Hewlett-Packard Co. | Checking narrow-band |
| RF Signal Generator, Model 608C/D, Hewlett-Packard Co. | Checking tuning unit |
| RF Signal Generator, Model MSG-2R, Polarad Electronics Corp. | Checking tuning unit |
| Crystal Calibrator, Model 111B, Measurements Corp. | Checking the sweep generator |
| Sweep Generator, Model H3, Telonic Industries Inc. | Checking wide band amplifier |
| Wavemeters, Models N410A and H410A, FXR Inc. | Checking tuning unit |
| Klystron Mode Alignment Modulator, Model MK-1, Polarad Electronics Corp. (See figure 4-9) | Checking tuning unit |
| Audio Oscillator, Series 200, Hewlett-Packard Co. | Checking video gain |

## 4-5. MINIMUM PERFORMANCE STANDARDS.

4-6. Tables 4-2a and 4-2b list the minimum performance standards for the Model TSA-W. The purpose of the minimum performance standards is to determine if the equipment is operating satisfactorily and is ready for use. Figure 4-1 is a block diagram showing waveshapes at specific points to aid in locating trouble. If excessive signal levels are required at any point, the trouble is between that point and the point previously checked.

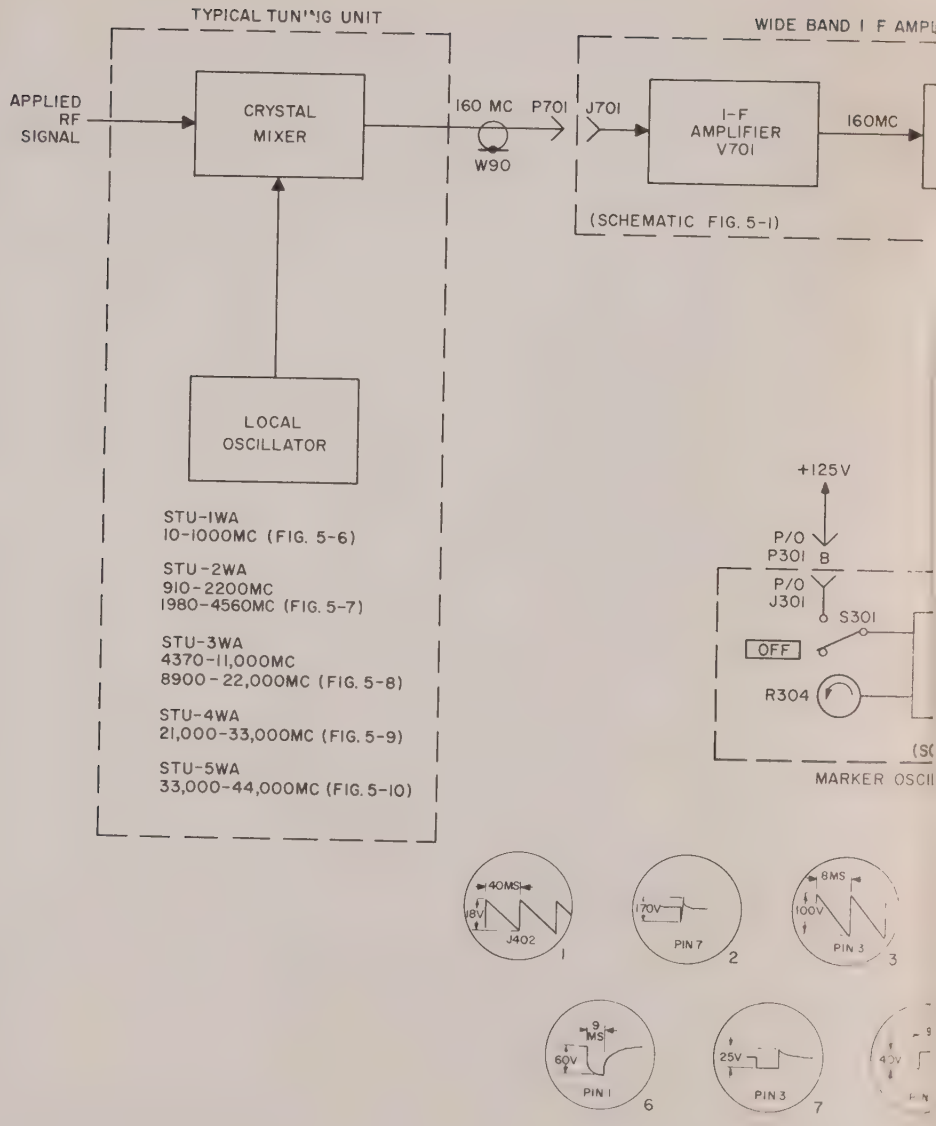
TABLE 4-2a. MINIMUM PERFORMANCE STANDARDS

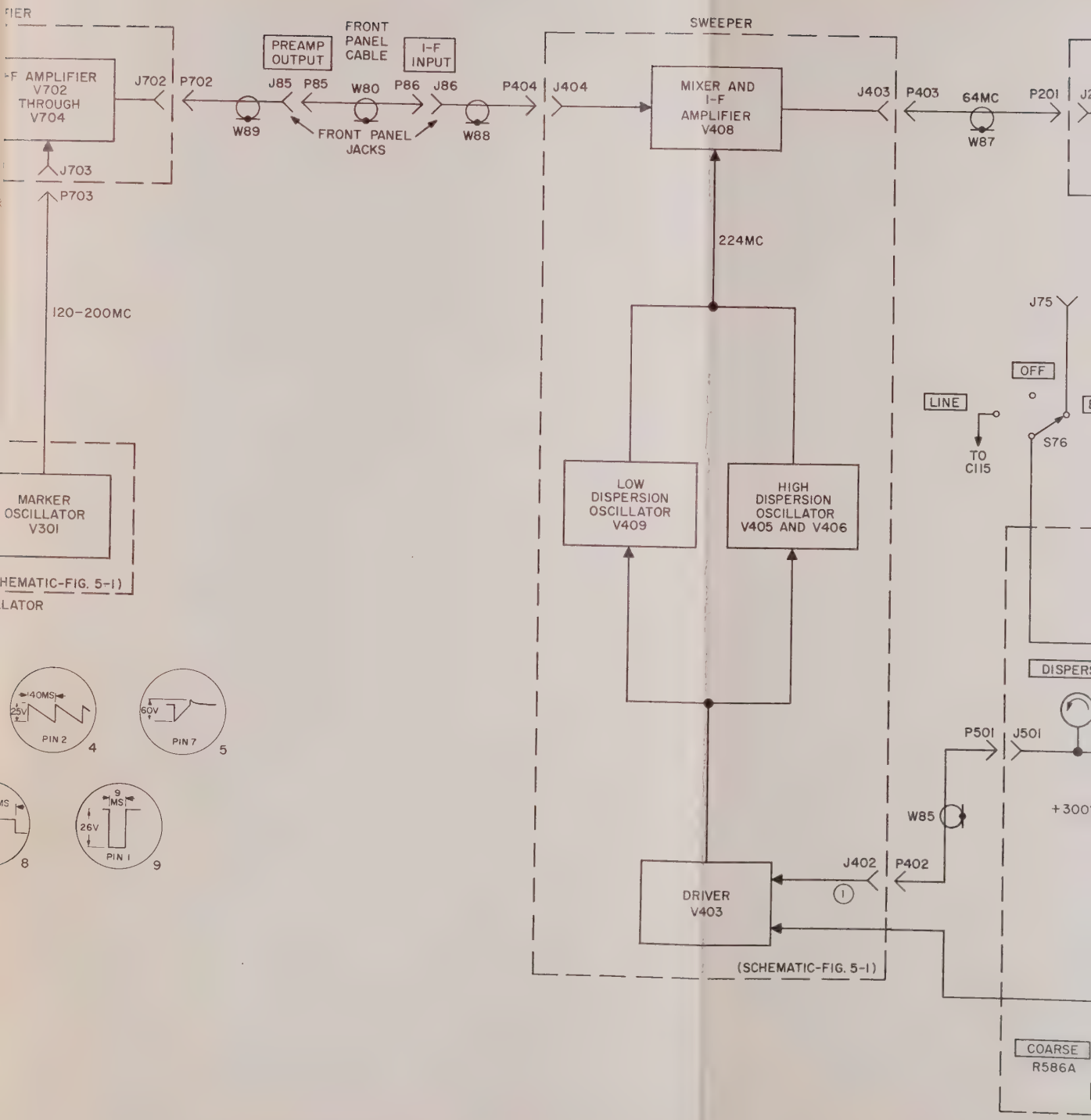
| Step | Purpose | Procedure | Normal Indication | Abnormal Indication Reference |
|---|---|---|---|---|
| 1 | Determine whether power is being applied | Place ON-OFF switch in the ON position | Power indicator illuminated; screen scale illuminated; blower fan on | Table 4-3, Step 1 |
| 2 | Determine scale illumination variation | Rotate the SCALE ILLUM control thru its full range | Screen scale illumination varies from off to maximum intensity | Table 4-3, Step 2 |
| 3 | Determine whether CRT display is operating | a. Rotate the VERT POS and the HOR POS controls thru their full range | a. Sweep trace moves up or down and left or right | Table 4-3, Step 3 |
| | | b. Using the controls stated in a, above, position sweep trace so that it lies one inch below horizontal center and is vertically centered on screen. Adjust BRIGHTNESS and FOCUS controls for a sweep trace of suitable brightness and sharpness | b. Sweep trace is sharpened and retrace disappears | |
| | | c. Rotate the HOR GAIN control through its full range | c. Sweep length narrows or expands, depending on direction of rotation | Table 4-3, Step 5 |
| | | d. While applying a low-level signal to the DIRECT INPUT jack on the Rf Tuning Unit, rotate the VERT GAIN control through its full range | d. Pattern height increases or decreases, depending on direction of rotation | Table 4-3, Step 6 |
| | | e. Set the HOR GAIN control for a four-inch wide trace. Rotate the SWEEP SPEED control through its full range | e. Sweep trace frequency varies from low frequency (1 cps) with flicker to high frequency (30 cps) without flicker | Table 4-3, Step 7 |

(Cont'd)

TABLE 4-2a. MINIMUM PERFORMANCE STANDARDS (Cont'd)

| Step | Purpose | Procedure | Normal Indication | Abnormal Indication Reference |
|---|---|---|---|---|
| 4 | Determine whether marker oscillator is operating | a. Energize marker oscillator by rotating the MARKER AMPLITUDE control | a. Marker pip height varies from zero to maximum; also height of pip is determined by setting of VERT GAIN control | Table 4-3, Step 8 |
| | | b. Rotate COARSE FREQUENCY DIFFERENCE-MCS TUNING control fully CW and CCW starting from "0" position | b. Marker pip moves from center to extreme left of screen and back through center to extreme right of screen | Table 4-3, Step 9 |
| 5 | Determine the characteristics of the DISPERSION control | Adjust the COARSE FREQUENCY DIFFERENCE-MCS TUNING control until pip is centered on screen. Rotate the DISPERSION control through its full range | Width of marker pip varies | Table 4-3, Step 10 |
| 6 | Determine the characteristics of the BANDWIDTH control | a. Apply a 160 mc c-w signal to the I-F INPUT connector. Rotate BANDWIDTH control fully CW (80 Kc/s position) | a. A response curve as shown in figure 4-2 appears | Table 4-3, Step 11 |
| | | b. With the signal still being applied rotate the BANDWIDTH control fully CCW (1 Kc/s position) | b. A nearly symmetrical reduction of the curve occurs. The resultant curve is shown in figure 4-3. The center line of the curve may move to the left slightly | |


TYPICAL TUNING UNIT
APPLIED RF SIGNAL
CRYSTAL MIXER
LOCAL OSCILLATOR
160 MC
P701
W90
J701
I-F AMPLIFIER V701
160MC
WIDE BAND I F AMPL
(SCHEMATIC FIG. 5-1)
STU-1WA
10-1000MC (FIG. 5-6)
STU-2WA
910-2200MC
1980-4560MC (FIG. 5-7)
STU-3WA
4370-11,000MC
8900-22,000MC (FIG. 5-8)
STU-4WA
21,000-33,000MC (FIG. 5-9)
STU-5WA
33,000-44,000MC (FIG. 5-10)
+125V
P/O P301
8
P/O J301
S301
OFF
R304
MARKER OSCIL
40MS
8V
J402
1
170V
PIN 7
2
8MS
100V
PIN 3
3
9 MS
60V
PIN 1
6
25V
PIN 3
7


FIER
F AMPLIFIER V702 THROUGH V704
J702
P702
PREAMP OUTPUT
FRONT PANEL CABLE
I-F INPUT
J85
P85
W80
P86
J86
P404
J404
W89
W88
FRONT PANEL JACKS
SWEEPER
MIXER AND I-F AMPLIFIER V408
J403
P403
64MC
P201
W87
J703
P703
120-200MC
224MC
J75
OFF
LINE
TO C115
S76
MARKER OSCILLATOR V301
HEMATIC-FIG. 5-1)
LATOR
LOW DISPERSION OSCILLATOR V409
HIGH DISPERSION OSCILLATOR V405 AND V406
DISPERS
40MS
25V
PIN 2
4
60V
PIN 7
5
P501
J501
W85
+300
9 MS
26V
PIN 1
8
9
J402
P402
DRIVER V403
(SCHEMATIC-FIG. 5-1)
COARSE
R586A

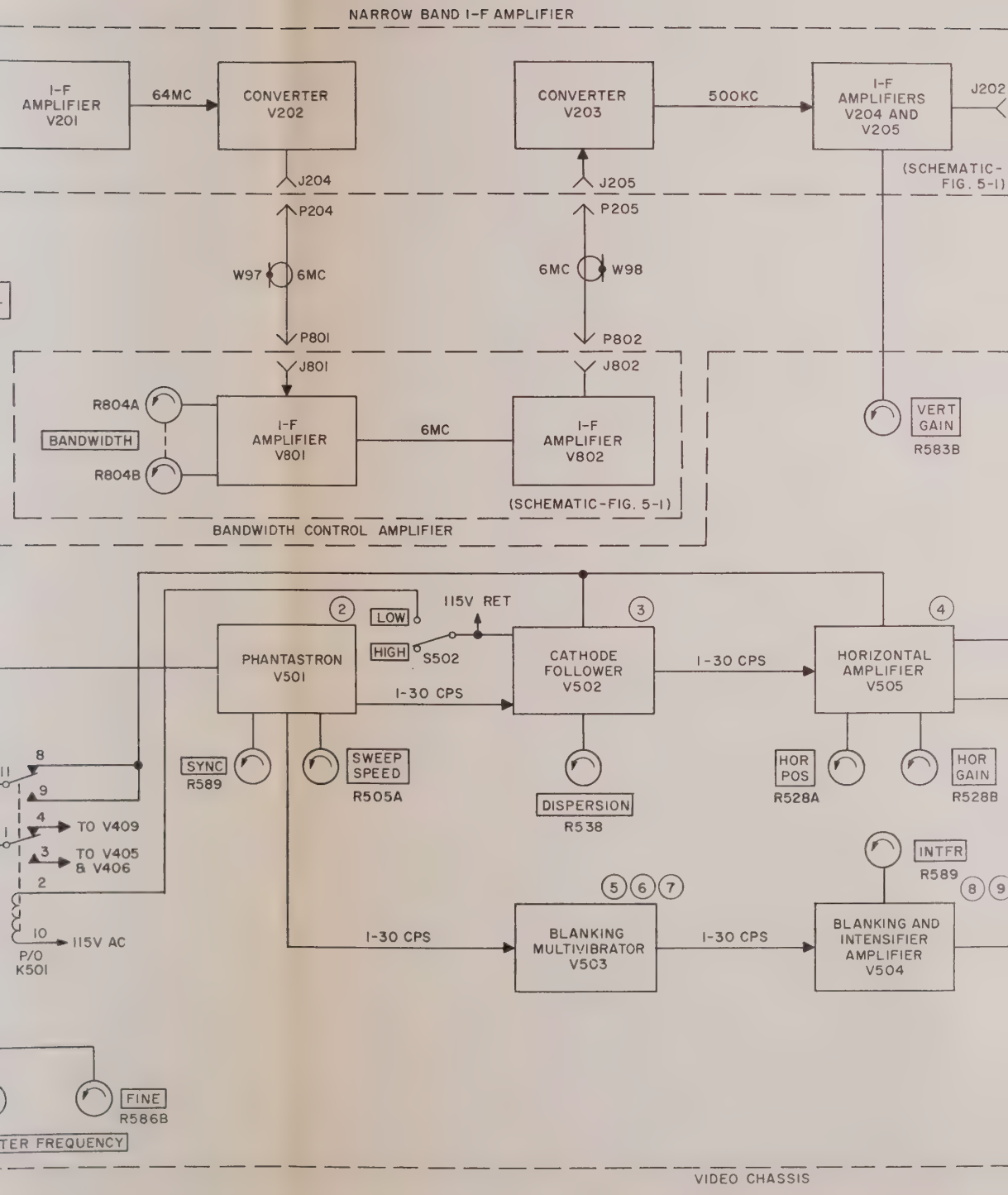
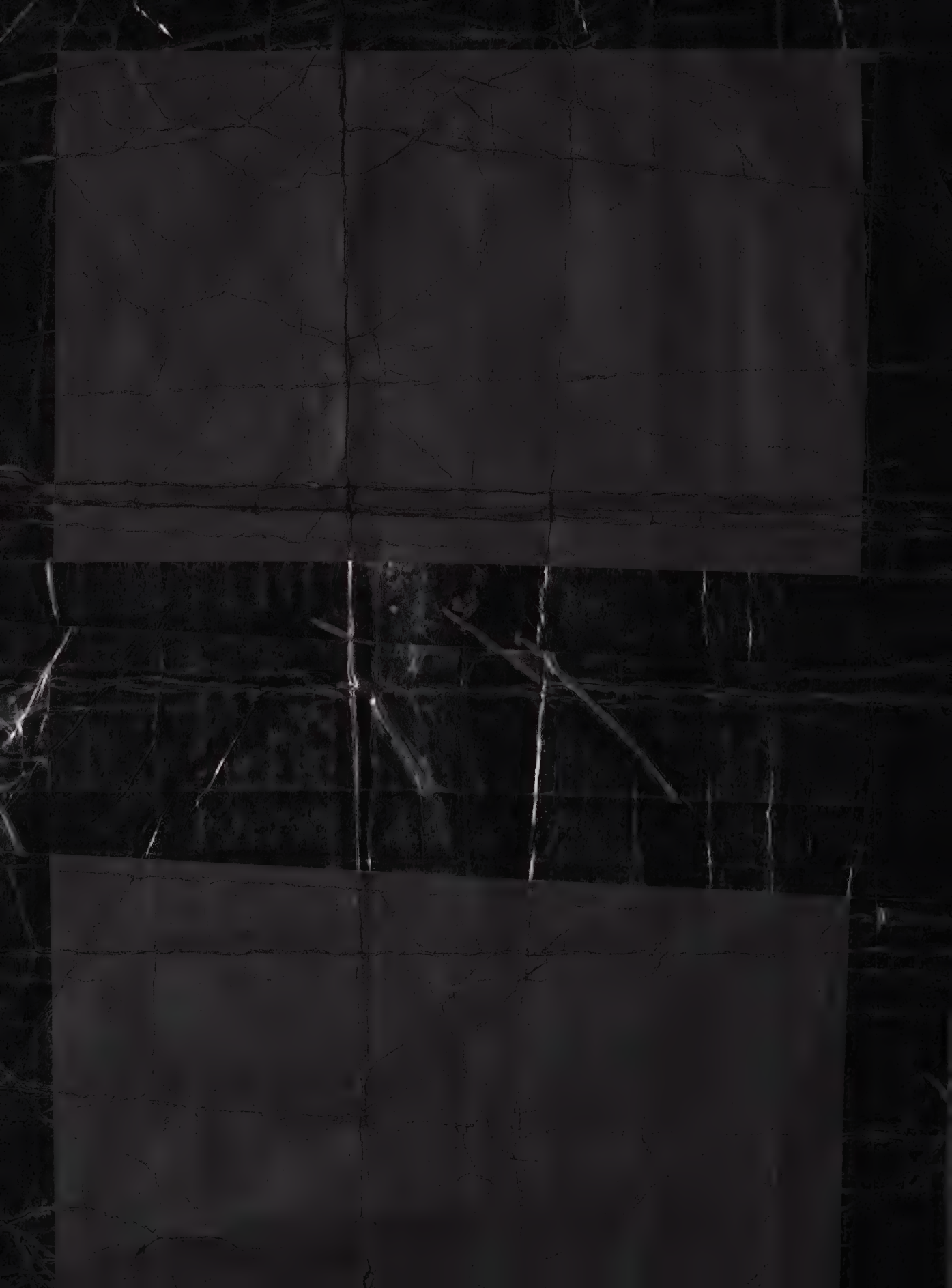
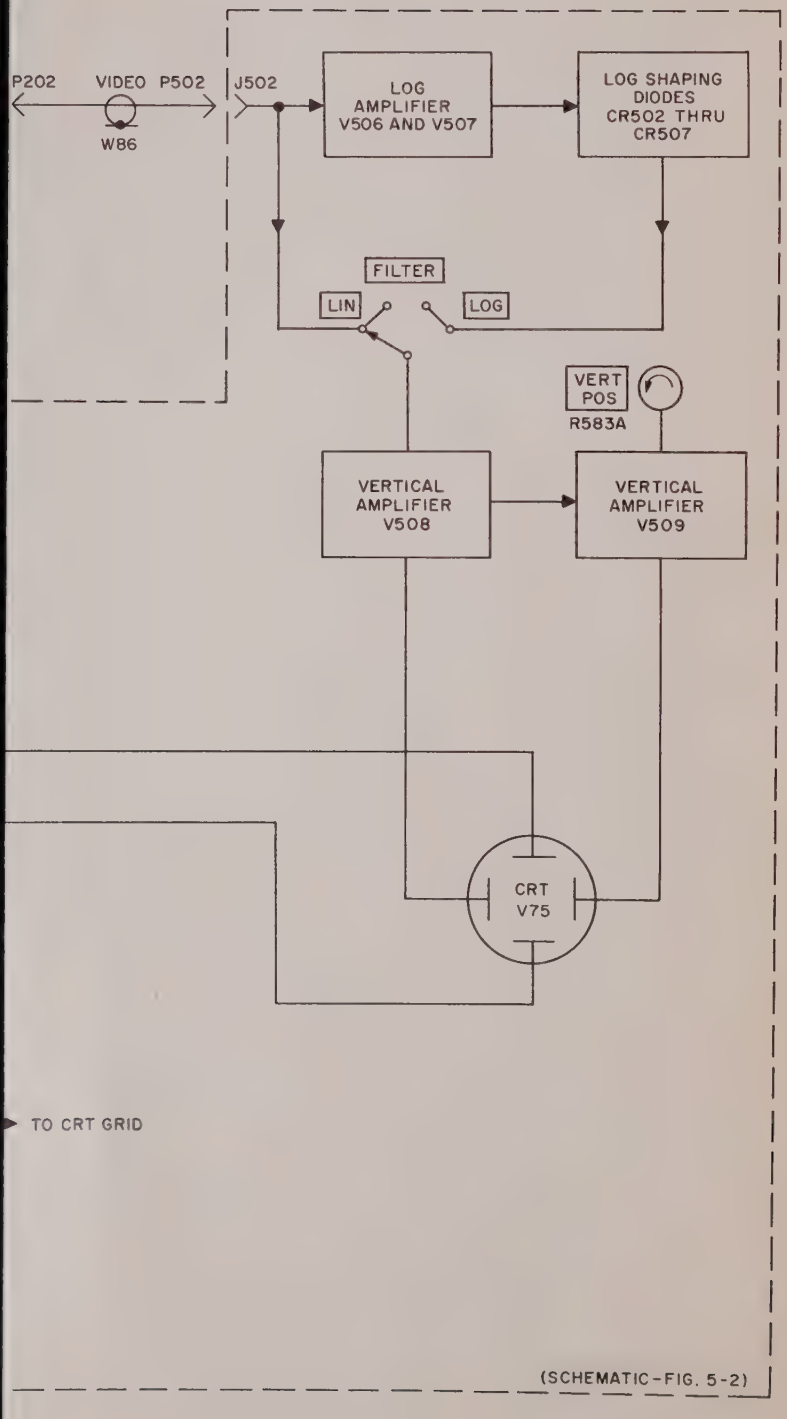

NARROW BAND I-F AMPLIFIER
I-F AMPLIFIER V201
64MC
CONVERTER V202
CONVERTER V203
500KC
I-F AMPLIFIERS V204 AND V205
J202
(SCHEMATIC-FIG. 5-1)
J204
J205
P204
P205
W97
6MC
6MC
W98
P801
P802
J801
J802
R804A
BANDWIDTH
R804B
I-F AMPLIFIER V801
6MC
I-F AMPLIFIER V802
(SCHEMATIC-FIG. 5-1)
BANDWIDTH CONTROL AMPLIFIER
VERT GAIN
R583B
2
LOW
115V RET
3
4
PHANTASTRON V501
HIGH
S502
CATHODE FOLLOWER V502
1-30 CPS
HORIZONTAL AMPLIFIER V505
1-30 CPS
8
9
4
TO V409
3
TO V405 & V406
2
10
115V AC
P/O K501
SYNC
R589
SWEEP SPEED
R505A
DISPERSION
R538
HOR POS
R528A
HOR GAIN
R528B
INTFR
R589
8
9
5
6
7
1-30 CPS
BLANKING MULTIVIBRATOR V503
1-30 CPS
BLANKING AND INTENSIFIER AMPLIFIER V504
FINE
R586B
TER FREQUENCY
VIDEO CHASSIS

Figure 4-1.






Block Diagram Showing Signal Levels

TABLE 4-2b. MINIMUM PERFORMANCE STANDARDS

| Circuit | Input Signal | Applied to | Normal Vertical Deflection on CRT |
|---|---|---|---|
| Vertical Amplifier | 1000 cps, 4.5 volts peak-to-peak | J502 | 10 cm. |
| Narrow Band | 64 mc (nominal) 30% modulation at 1000 cps 15 uV. | J201 | 2 cm. |
| Sweeper | 160 mc. 25 uV | J404 | 2 cm. |
| Wide Band | 160 mc. 2 uV | J701 | Signal plus Noise equal to Twice Noise |

The above checks are made with the following panel control settings:

| | |
|---|---|
| VERT GAIN | Maximum CW |
| BANDWIDTH | Maximum CW |
| DISPERSION HIGH-LOW | Low |
| DISPERSION CONTROL | Maximum CW |
| LOG-FILTER-LIN switch | LIN |
| SWEEP SPEED | Maximum CW |

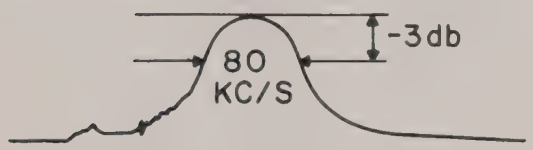



Figure 4-2. Response Curve for Variable Bandwidth If Control Amplifier With Bandwidth Control Set Fully Cw (80 kc/s position)

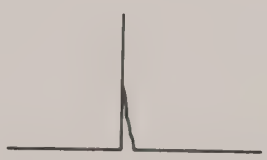


Figure 4-3. Response Curve for Variable Bandwidth If Control Amplifier With Bandwidth Control Set Fully Ccw (1 kc/s position)

## 4-7. SYSTEM TROUBLESHOOTING.

4-8. The system troubleshooting procedure for the Model TSA-W is given in table 4-3. The procedure follows the normal operational sequence for Model TSA-W. The probable causes for the symptoms listed are given in the order of their probability of occurrence.

TABLE 4-3. SYSTEM TROUBLESHOOTING

| Step | Symptom | Probable Cause | Remedy |
|---|---|---|---|
| 1 | POWER indicator does not light when ON-OFF switch is set at ON | No ac power input | Check ac line |
| | | | Check power cord |
| | | | Check power cord connection to equipment |
| | | Fuses F101 and/or F102 open | Replace defective fuses |
| | | POWER indicator DS76 defective | Replace lamp in DS76 |
| | | ON-OFF switch S75 defective | Replace switch S75 |
| | | Component defective | Refer to table 4-4, step 1 |
| 2 | Screen scale illumination is off or does not vary when SCALE ILLUM control is rotated | SCALE ILLUM control R77 defective | Replace defective control |
| 3 | No sweep trace on screen | Cables are not connected to chassis | Check for proper cable connections. See figure 5-5 |
| | | Component defective | Refer to table 4-4, step 3 |
| 4 | Sweep trace is not affected when BRIGHTNESS and FOCUS controls are adjusted | BRIGHTNESS and FOCUS controls R78 and R79 respectively are defective | Replace controls R78 and R79 |
| | | Components defective | Refer to table 4-4, step 3 |
| 5 | Sweep length fails to decrease or increase as the HOR GAIN control is rotated | HOR GAIN control R528B is defective | Replace control R528B |
| | | Component defective | Refer to table 4-4, steps 4 and 5 |
| 6 | Pattern height of applied signal is not affected by the rotation of the VERT GAIN control | VERT GAIN control R583B is defective | Replace control R583B |
| | | Component defective | Refer to table 4-4, step 5 |
| 7 | Sweep trace frequency does not vary when the SWEEP SPEED control is rotated | SWEEP SPEED control R505A is defective | Replace control R505A |
| | | Component defective | Refer to table 4-4, step 6 |
| 8 | No marker pip or marker pip remains at a set height when rotating the MARKER AMPLITUDE control | MARKER AMPLITUDE control R304 and/or switch S301 are defective | Replace control R304 and/or switch S301 |

(cont'd)

TABLE 4-3. SYSTEM TROUBLESHOOTING (Cont'd)

| Step | Symptom | Probable Cause | Remedy |
|---|---|---|---|
| 9 | Marker pip does not move when the FREQUENCY DIFFERENCE MCS COARSE and/or VERNIER controls are rotated | FREQUENCY DIFFERENCE MCS COARSE and/or VERNIER controls C302 and/or C312 are defective | Replace control C302 and/or C312 or repair its mechanical drive |
| 10 | Width of marker pip does not change when the DISPERSION control is rotated | DISPERSION control R538 is defective | Replace control R538 |
| | | Component defective | Refer to table 4-4, step 6 |
| 11 | Response curves as shown in figures 4-2 and 4-3 are not present when the BANDWIDTH control is placed in the extreme CW and CCW positions, respectively | BANDWIDTH control R804 is defective | Replace control R804 |
| | | Component defective | Refer to table 4-4, step 9 |
| | | Variable resolution amplifier is misaligned | Align variable resolution amplifier (see paragraph 4-34) |

## 4-9. DETAILED TROUBLESHOOTING.

4-10. The detailed troubleshooting procedure for the Model TSA-W is given in table 4-4. If the trouble has been localized to a single assembly or circuit during system troubleshooting, start the detailed troubleshooting at the step referenced in table 4-3. If the location of the trouble is indefinite or cannot be localized to a single assembly or circuit, start the detailed troubleshooting at the step that most closely resembles the trouble encountered.

4-11. Use the diagrams in Section V and the parts list in Section VI to supplement the detailed troubleshooting procedure of table 4-4.

## 4-12. DISASSEMBLY AND REASSEMBLY INSTRUCTIONS. (See figures 4-4 through 4-7.)

4-13. The Model TSA-W should only be disassembled to the extent necessary to effect replacement or repairs.

4-14. DUST COVER REMOVAL. Access to all major assemblies and components mounted on the main chassis is obtained by removal of the dust cover. To remove the dust cover, proceed as follows:

a. At the rear of the dust cover, release the four fasteners by turning them a half-turn counterclockwise.

b. Grasp the handles on the tuning unit and pull the chassis out of the dust cover.

4-15. TUNING UNITS REMOVAL. Access to the components of the rf tuning units is obtained by removing them from the main chassis. To remove a unit, proceed as follows:

a. At the tuning unit front panel, rotate the four captive screws CCW until they are free.

b. Grasp the handles on the tuning unit and carefully manipulate the unit out of the main chassis.

c. The unit is electrically disconnected from the main chassis by removing receptacle P104 from its mating multi-pin connector J104, and coaxial cable W90.

TABLE 4-4. DETAILED TROUBLESHOOTING

| Step | Trouble | Troubleshooting Procedure |
|---|---|---|
| 1 | Power input circuit open | Check continuity of transformer T101 terminals 1-3 and 4-7 |
| 2 | Rf tuning unit fails to operate | Check time delay relay K101 using Model WV98A voltmeter |
| | | Check rectifier tubes V101 and V102 |
| | | Check capacitors C101 and C102 for short using Model 260 multimeter |
| | | Check transformer T103 for continuity (see figure 5-3) |
| | | Check tubes V103 thru V110 and associated circuitry |
| | | Check the 4 rectifiers in the bridge CR110 |
| | | Check and adjust, if required, control R117 or R123 depending upon tuning head in use, using Model 260 multimeter. (see paragraph 4-27) Measurement and adjustment are made at the rear of main chassis (see figure 4-4) |
| 3 | Low intensity of spectrum or no trace | Check transformer T603 for continuity (see figure 5-3) |
| | | Check tubes V616, V617 and V618 and associated resistors and capacitors using Model 260 multimeter |
| 4 | HOR GAIN and HOR POS control do not affect trace | Check tube V505 and associated resistors and capacitors using Model 260 multimeter |
| 5 | VERT GAIN and VERT POS controls do not affect trace | Check amplifier tubes V508 and V509 and associated resistors and capacitors using Model 260 multimeter |
| 6 | DISPERSION and SWEEP SPEED controls do not affect trace | Check sawtooth generator tubes V501 and V502 and associated resistors and capacitors using Model 260 multimeter |
| 7 | MARKER AMPLITUDE control does not affect trace | Check marker oscillator V301 and associated resistors and capacitor using Model 260 multimeter |
| 8 | CENTER FREQUENCY control does not affect marker pip | Check sweep frequency generator tubes V405, V403, V406, V408 and V409 and associated resistors and capacitors using Model 260 multimeter |
| | | Check controls R585 and R587 (see figure 5-7) |
| 9 | Display on crt screen fails to reduce symmetrically when the BANDWIDTH control is rotated from maximum CW to maximum CCW position | Check tubes V801 and V802 and associated resistors and capacitors using Model 260 multimeter and tuning of C802, C803, T801, T802. |
| | | Check narrow band i-f amplifier tubes V201 through V205 and associated resistors and capacitors using Model 260 multimeter and tuning |

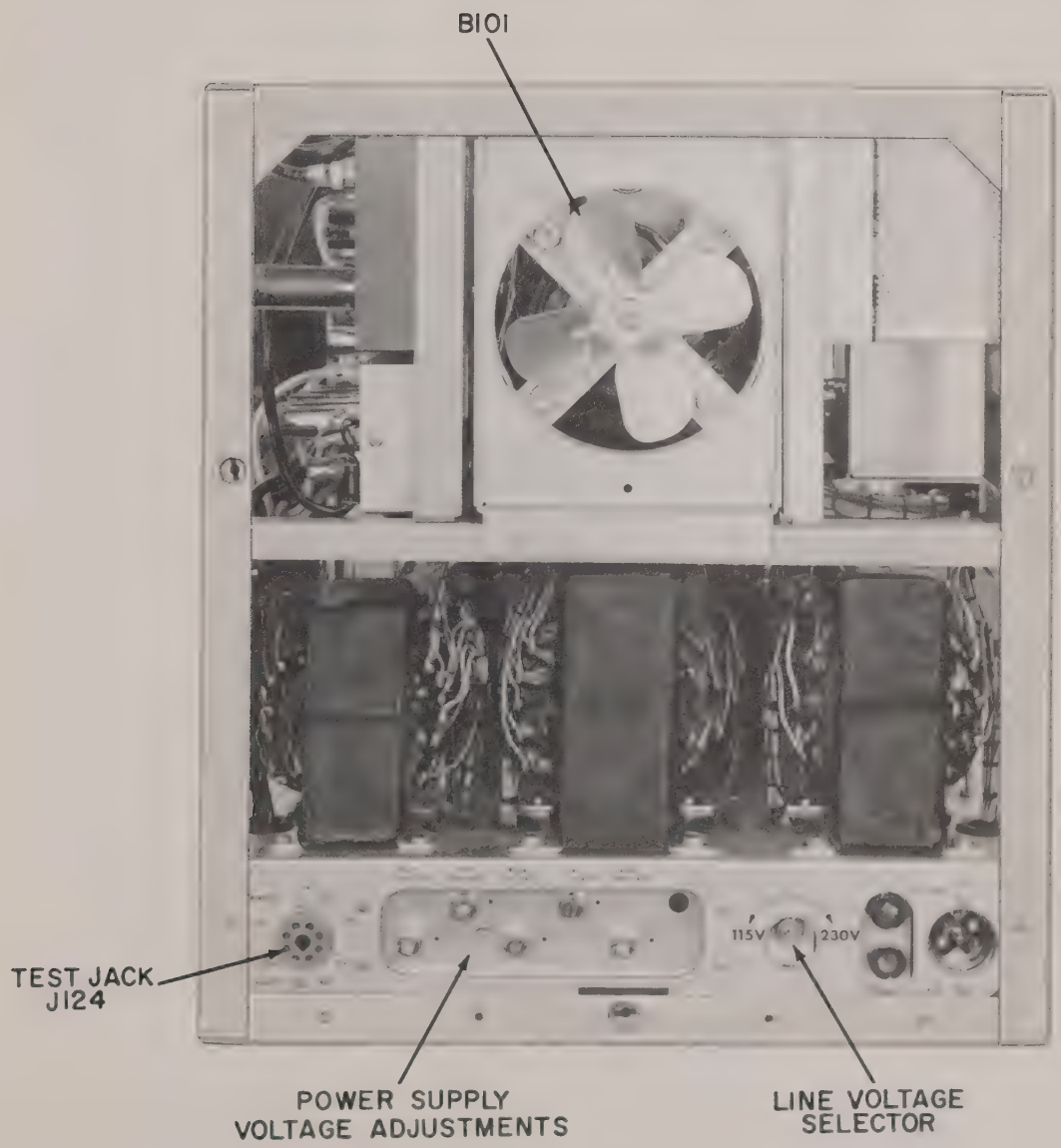



Figure 4-4. Rear View, Model DU-2A

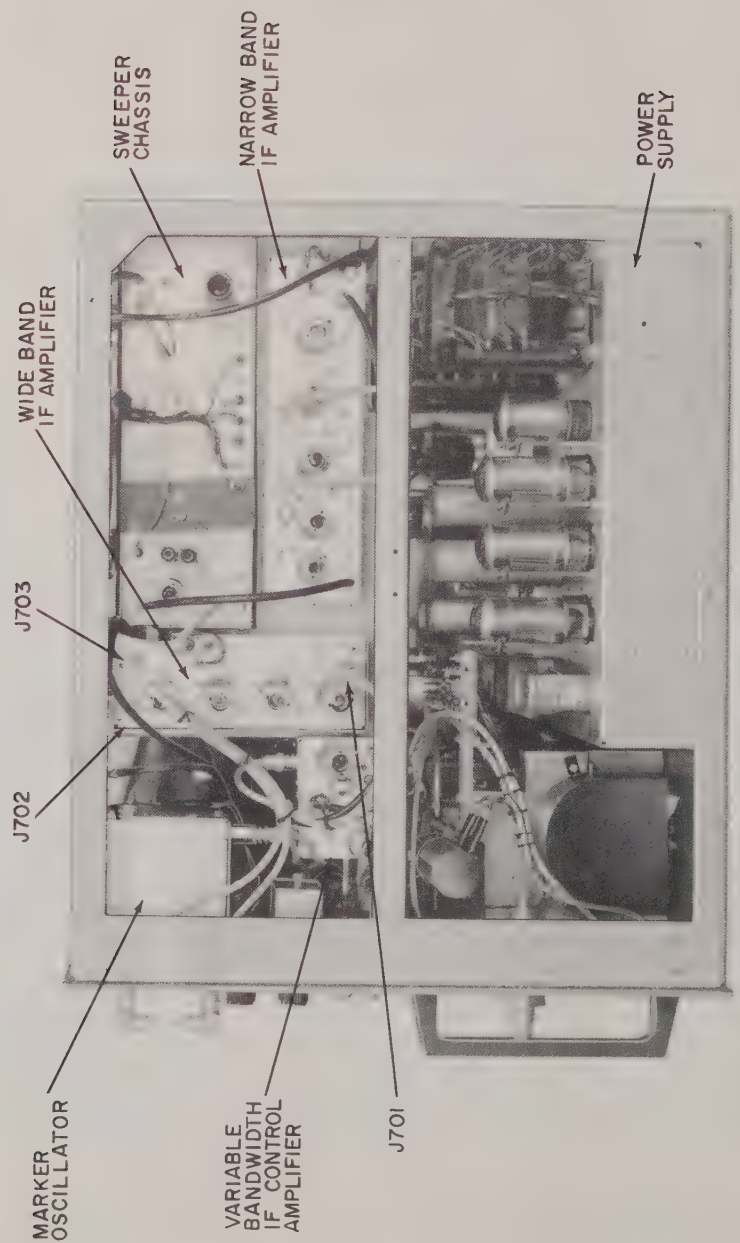



Figure 4-5. Right Side View, Model DU-2A

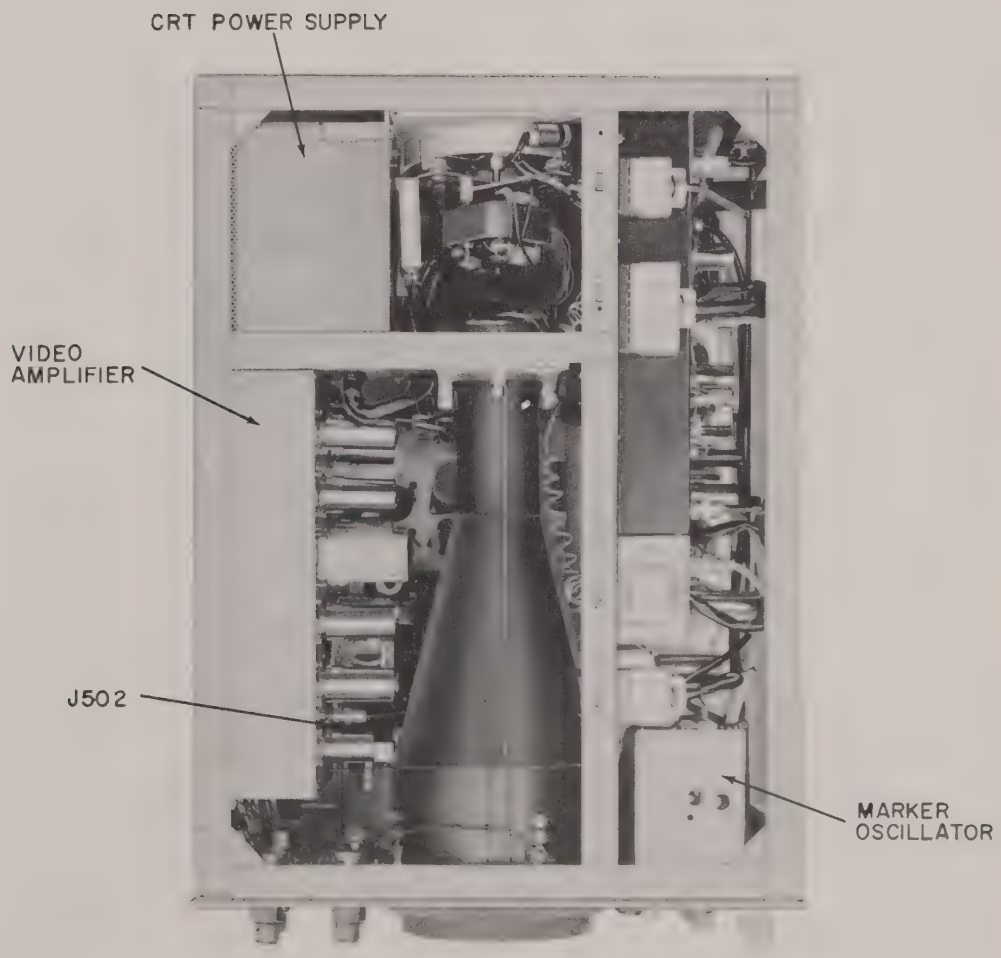



Figure 4-6. Top View, Model DU-2A

Figure 4-7. Left Side View, Model DU-2A

## 4-16. KLYSTRON TUBE REPLACEMENT.

4-17. The klystron tube is partially seated within the oscillator cavity which is assembled on the casting directly behind the tuning head front panel.

4-18. REMOVAL OF KLYSTRON TUBE. The operating power must be switched off before attempting klystron tube removal.

a. Remove the RF Tuning Unit from the basic unit.

b. Remove the breeze clamp holding the klystron protective cover to the klystron retainer nut. Slide the cover back.

c. Gently pull the tube socket assembly off the base of the klystron tube.

d. Use the spanner wrench supplied to loosen the large knurled retaining collar. Do not remove it completely.

e. Grasp the projecting end of the klystron tube, gently rotating it in a clockwise direction while simultaneously withdrawing the tube from its retaining springs within the cavity.

4-19. INSERTION OF REPLACEMENT KLYSTRON. The tube must be handled with extreme care to avoid damage.

a. Insert the tube carefully into the cavity, gently rotating the tube clockwise as the tube is pressed in, until it meets a positive stop. In the STU-2WA there will be one noticeable click as the tube passes its retaining spring. In the STU-3WA, STU-4WA and STU-5WA, there will be two noticeable clicks.

b. Retighten the large knurled retaining collar, using the spanner wrench.

c. Connect the tube socket to the base of the klystron tube. Use care to avoid breaking or bending the tube pins as the socket can be forced on in the wrong position. Pin No. 1 is the one separate from the other three.

d. Replace the klystron protective cover by fastening it in place with the breeze clamp.

e. Rotate the Anode Current Adjust control to its extreme CCW position.

4-20. KLYSTRON ANODE CURRENT ADJUSTMENT. Before making the current adjustment, check the Anode voltage from test jack J124 pin 8 to ground. Model STU-2WA should be -325 volts. Models STU-3WA, STU-4WA and STU-5WA should be -1250 volts. If incorrect refer to table 4-6 for adjustment.

4-21. MODEL STU-2WA

a. For klystron type 6BM6 rotate the Anode Current Adjust control to its extreme CCW position.

b. For klystron type 5837 connect the multimeter from R801 pin 1 to R801 pin 2 (pin 2 is +). Set the Anode Current Adjust (R801) for 10 volts.

4-22. MODELS STU-3WA, STU-4WA and STU-5WA. Connect the multimeter from pin 5 of test jack J124 (located at the bottom rear of the basic unit) and ground (pin 5 is +). Set Anode Current Adjust for 3.2 volts.

4-23. KLYSTRON FREQUENCY ALIGNMENT. Connect the test equipment as shown in figure 4-8.

a. Rotate the TUNING knob to the following frequencies and measure the oscillator frequency. Set the wavemeter pip at the center of the mode.

| Unit | Dial Freq. | Osc. Freq. |
|---|---|---|
| STU-2WA | 1600 mc | 1760 mc |
| STU-3WA | 8000 mc | 8160 mc |
| STU-4WA | 27, 500 mc | 9220 mc |
| STU-5WA | 39, 000 mc | 9790 mc |

b. Rotate the TUNING knob to the low frequency end and measure the oscillator frequency. Set the wavemeter pip at the center of the mode.

| Unit | Dial Freq. | Osc. Freq. |
|---|---|---|
| STU-2WA | 910 mc | 1070 mc |
| STU-3WA | 4370 mc | 4580 mc |
| STU-4WA | 21, 000 mc | 7053 mc |
| STU-5WA | 33, 000 mc | 8290 mc |

c. Rotate the TUNING knob to the high frequency end and measure the oscillator frequency. Set the wavemeter pip at the center of the mode.

| Unit | Dial Freq. | Osc. Freq. |
|---|---|---|
| STU-2WA | 4500 mc | 4660 mc |
| STU-3WA | 11, 000 mc | 11, 160 mc |
| STU-4WA | 33, 000 mc | 11, 053 mc |
| STU-5WA | 44, 000 mc | 11, 040 mc |

d. If the measured oscillator frequency is within 1% of the above listed oscillator frequency, no further adjustment is necessary.

e. If the frequency accuracy is not within 1%, loosen the setscrew that locks the push-rod adjustment screw and turn the push-rod adjustment screw until the frequency is within 1% for steps a, b, and c.

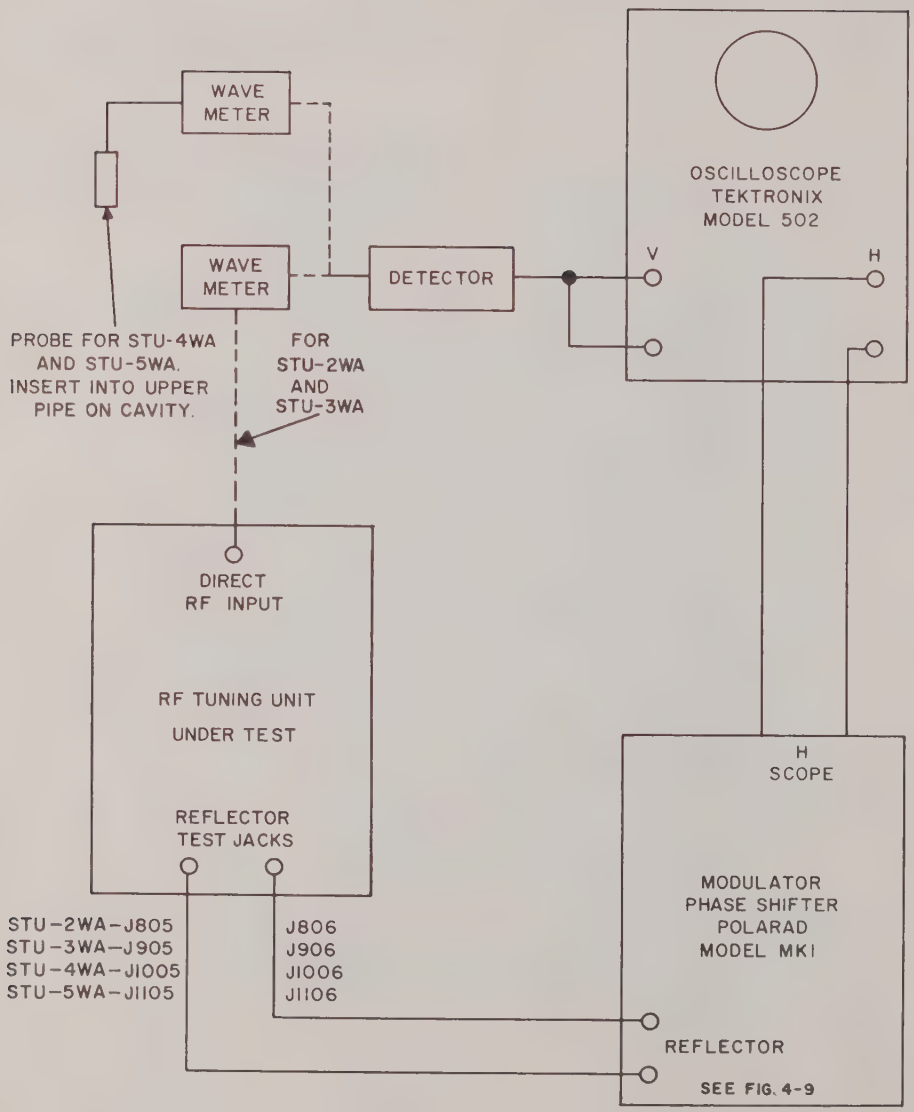



Figure 4-8. Klystron Frequency Test Setup

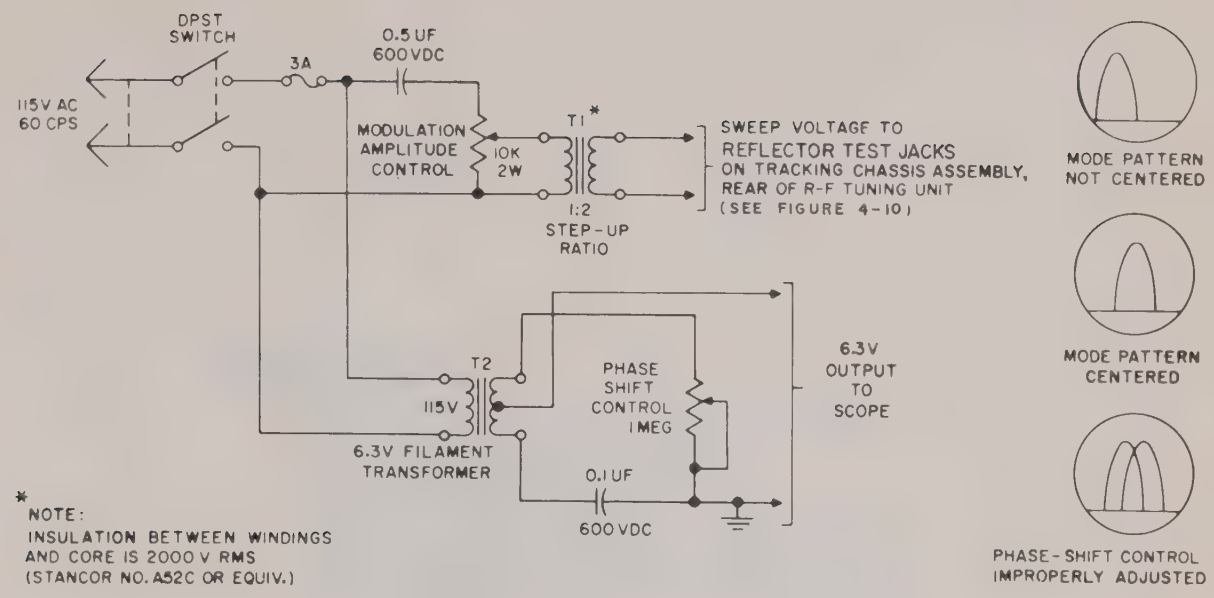

DPST SWITCH
3A
0.5 UF 600 VDC
115 V AC 60 CPS
MODULATION AMPLITUDE CONTROL
10K 2W
T1 *
1:2 STEP-UP RATIO
SWEEP VOLTAGE TO REFLECTOR TEST JACKS ON TRACKING CHASSIS ASSEMBLY, REAR OF R-F TUNING UNIT (SEE FIGURE 4-10)
T2
115 V
6.3 V FILAMENT TRANSFORMER
PHASE SHIFT CONTROL 1 MEG
0.1 UF
600 VDC
6.3 V OUTPUT TO SCOPE
* NOTE: INSULATION BETWEEN WINDINGS AND CORE IS 2000 V RMS (STANCOR NO. A52C OR EQUIV.)
MODE PATTERN NOT CENTERED
MODE PATTERN CENTERED
PHASE-SHIFT CONTROL IMPROPERLY ADJUSTED

Figure 4-9. Modulator and Phase Shifting Circuits, Schematic Diagram

4-24. KLYSTRON REPELLER TRACKING VOLTAGE ADJUSTMENT. Connect the test equipment as shown in figure 4-11.

a. Rotate the TUNING knob to set the frequency dial to the high end.

b. Adjust HIGH LIMIT so that the mode is centered on the trace (See figure 4-10).

c. Rotate the TUNING knob to the high frequency side of the mode switch.

| Unit | Mode Switch Frequency |
|---|---|
| STU-2WA | 1400 mc |
| STU-3WA | 7850 mc |
| STU-4WA | 23,800 mc |
| STU-5WA | No mode switch |

d. Adjust HIGH MODE so that the mode is centered on the trace.

e. Rotate the TUNING knob to the low frequency side of the mode switch.

f. Adjust LOW MODE so that the mode is centered on the trace.

g. Rotate the TUNING knob to the low frequency end.

h. Adjust LOW LIMIT so that the mode is centered on the trace.

i. Repeat steps a thru h until no further adjustments are necessary.

## 4-25. ELECTRON TUBE AND SEMICONDUCTOR REPLACEMENT.

4-26. Replacing certain tubes and semiconductors necessitates a check on the alignment or calibration of the section in which the replacement was made. Table 4-5 lists the tubes and semiconductors contained in the Model TSA-W and states what alignment procedure, if any, is necessary when a replacement is made.

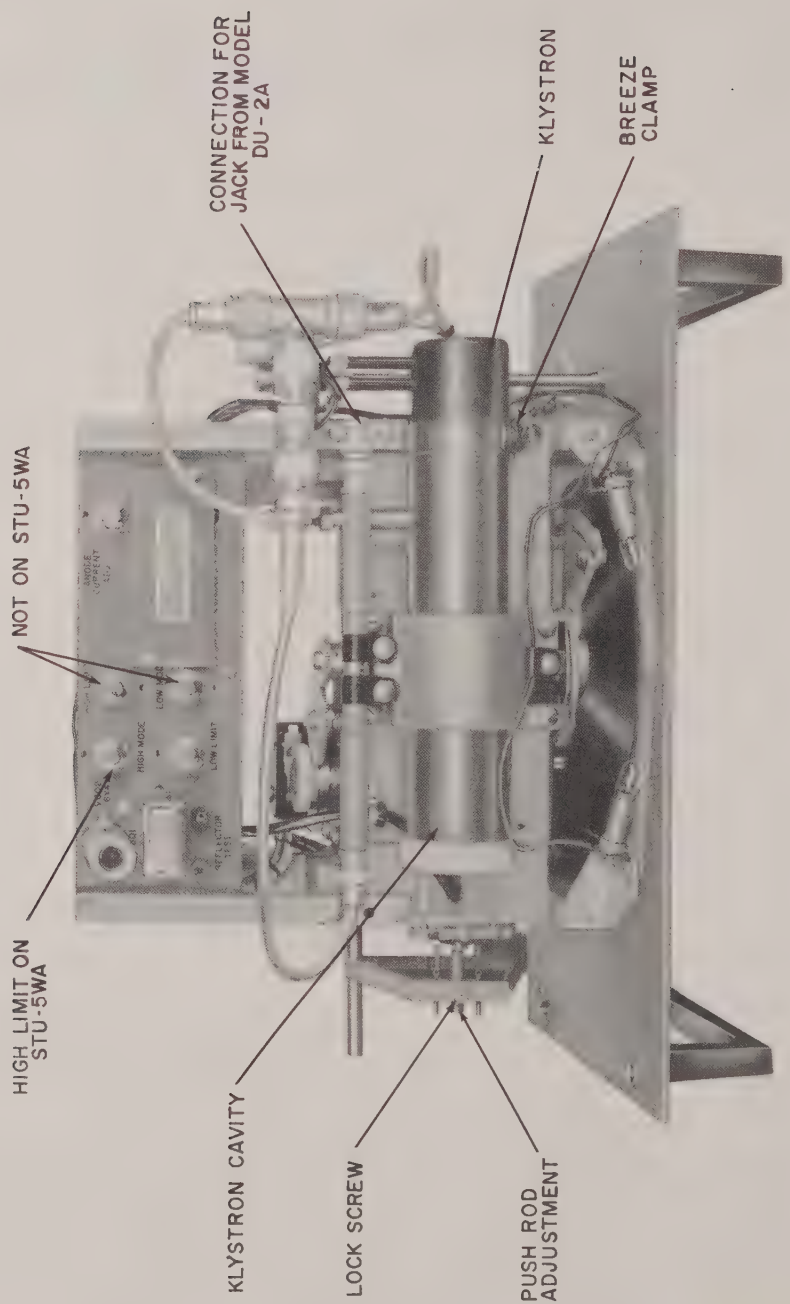



Figure 4-10. Top View of Typical RF Tuning Unit

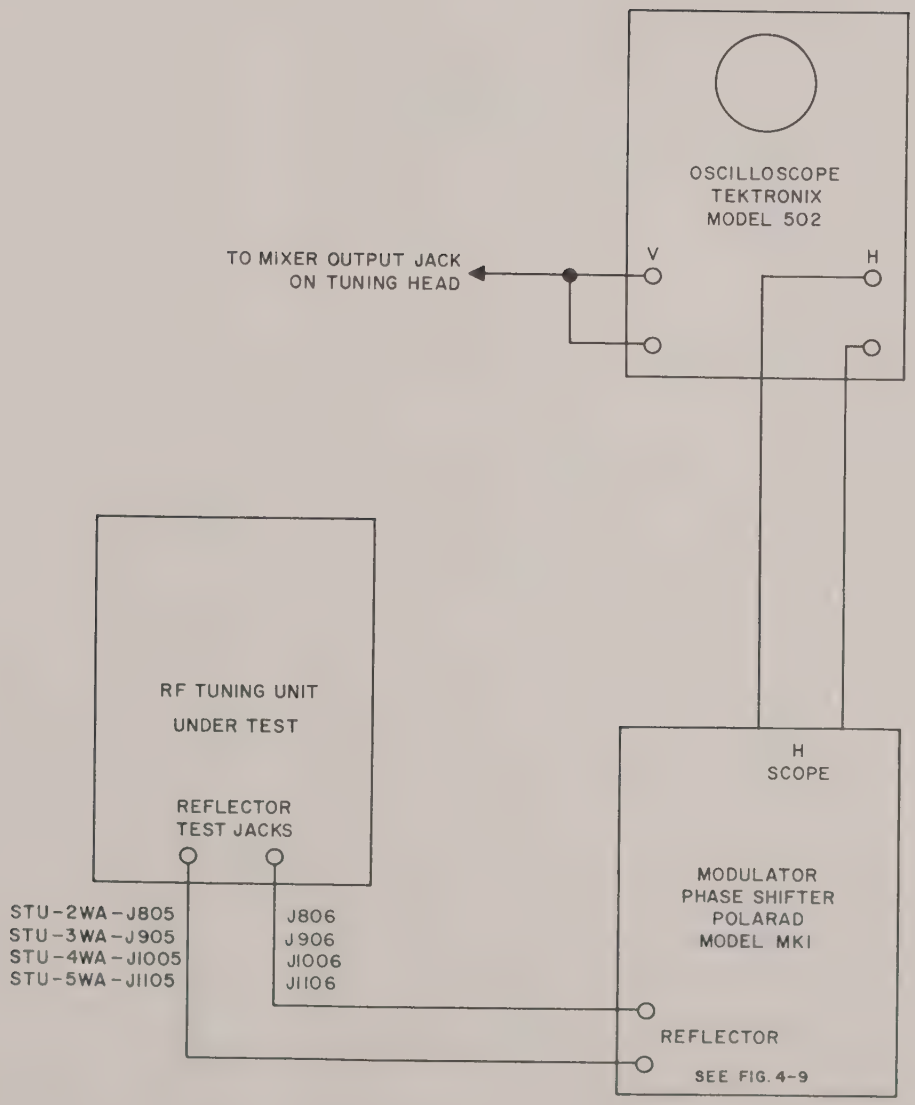



Figure 4-11. Klystron Repeller Tracking Voltage Test Setup

TABLE 4-5. ELECTRON TUBE AND SEMICONDUCTOR REPLACEMENT

| Ref. Symbol | Type | Alignment Required After Replacement |
|---|---|---|
| | | BASIC UNIT DU-2A |
| V101 | 5R4 | |
| V102 | 5R4 | |
| V103 | 807 | |
| V104 | 807 | Check -1,250 volt and -325 volt power supply adjustments. See paragraph 4-29. |
| V105 | 12AX7 | |
| V106 thru V110 | OA2 | None |
| V111 | 6080 | Check +125 volt supply. See paragraph 4-29. |
| V112 | 5881 | Check -150 volt supply. See paragraph 4-29. |
| V113 | 6080 | Check +300 volt supply. See paragraph 4-29. |
| V114 | 6080 | Check +125 volt supply. See paragraph 4-29. |
| V115 | 12AX7 | Check -150 volt supply. See paragraph 4-29. |
| V116 | 12AX7 | Check +300 volt supply. See paragraph 4-29. |
| V117 | 12AX7 | Check +125 volt supply. See paragraph 4-29. |
| V118 | 5651 | None |
| V201 | 6AK5 | Check narrow band i-f alignment. See paragraph 4-32. |
| V202 | 6BE6 | Check narrow band i-f alignment. See paragraph 4-32. |
| V203 | 6BE6 | Check narrow band i-f alignment. See paragraph 4-32. |
| V204 | 6AH6 | Check narrow band i-f alignment. See paragraph 4-32. |
| V205 | 6AH6 | Check narrow band i-f alignment. See paragraph 4-32. |
| V301 | 5718 | Check marker alignment. See paragraph 4-33. |
| V403 | 6005 | Check sweeper alignment. See paragraph 4-31. |
| V405 and V406 | 5718 | Check sweeper alignment. See paragraph 4-31. |
| V408 | 6AK5 | Check sweeper alignment. See paragraph 4-31. |
| V409 | 5718 | Check sweeper alignment. See paragraph 4-31. |
| V501 | 6AS6 | None |
| V502 | 12AT7 | Check horizontal zero adjustment. See paragraph 4-35. |

(Cont'd)

TABLE 4-5. ELECTRON TUBE AND SEMICONDUCTOR REPLACEMENT (Cont'd)

| Ref. Symbol | Type | Alignment Required After Replacement |
|---|---|---|
| V503 | 12AU7 | None |
| V504 | 12AU7 | None |
| V505 | 12AU7 | None |
| V506 | 6AN8 | Check log zero adjustment. See paragraph 4-36. |
| V507 | 6AN8 | Check log zero adjustment. See paragraph 4-36. |
| V508 | 6AH6 | Check vertical amplifier gain. See paragraph 4-35. |
| V509 | 6AH6 | Check vertical amplifier gain. See paragraph 4-35. |
| V616 | 6AR6 | None |
| V617 and V618 | 1Z2 | None |
| V701 thru V704 | 6922 | Check wide band i-f amplifier alignment. See paragraph 4-30. |
| V801 | 12AT7 | Check alignment of bandwidth control i-f amplifier. See paragraph 4-34. |
| V802 | 6AG5 | Check alignment of bandwidth control i-f amplifier. See paragraph 4-34. |
| CR201 | 1N69 | None |
| CR402 | 1N82A | Check sweeper alignment. See paragraph 4-31. |
| CR501 | 1N69 | None |
| CR502 thru CR507 | 1N198 | Check log zero adjustment. See paragraph 4-36. |
| CR508 | 1N198 | None |
| | | RF TUNING UNITS |
| V601 | 6AF4A | Check Model STU-1WA calibration. See paragraph 4-23. |
| V801 | 6BM6, 5837 or ZV1009 | Check Model STU-2WA calibration. See paragraph 4-23. |
| V802 | 6X4 | None |
| V901 | 5721 | Check Model STU-3WA calibration. See paragraph 4-23. |
| V902 | 6X4 | None |
| V1001 | 5721 | Check Model STU-4WA calibration. See paragraph 4-23. |

(Cont'd)

TABLE 4-5. ELECTRON TUBE AND SEMICONDUCTOR REPLACEMENT (Cont'd)

| Ref. Symbol | Type | Alignment Required After Replacement |
|---|---|---|
| V1002 | 6X4 | None |
| V1101 | 5721 | Check Model STU-5WA calibration. See paragraph 4-23. |
| V1102 | 6X4 | None |
| CR601 | 1N21C | Check Model STU-1WA calibration. See paragraph 4-23. |
| CR801 | 1N21B or 1N23C | Check Model STU-2WA calibration. See paragraph 4-23. |
| CR901 | 1N26 or 1N78 | Check Model STU-3WA calibration. See paragraph 4-23. |
| CR1001 | 1N26 | Check Model STU-4WA calibration. See paragraph 4-23. |
| CR1101 | 1N53 | Check Model STU-5WA calibration. See paragraph 4-23. |
| Q651 | PADT30 | Check Model STU-1WA calibration. See paragraph 4-23. |

TABLE 4-6. POWER SUPPLY ADJUSTMENTS

| Supply | Meter Connections | Adjust |
|---|---|---|
| -1250 | Pin 8 of J124 and ground | Anode volts adj. pot. R123 for -1250 volts |
| -325* | Pin J of J104 and ground | -325 volt pot. R117 for -325 volts |
| +125 | Pin 6 of J124 and ground | +volt pot. R147 for +125 volts |
| -150 | Pin 3 of J124 and ground | 150 volt pot. R154 for -150 volts |
| +300 | Pin 7 of J124 and ground | +300 volt pot. R143 for +300 volts |

*Necessary only when using Tuning Unit Model STU-2WA

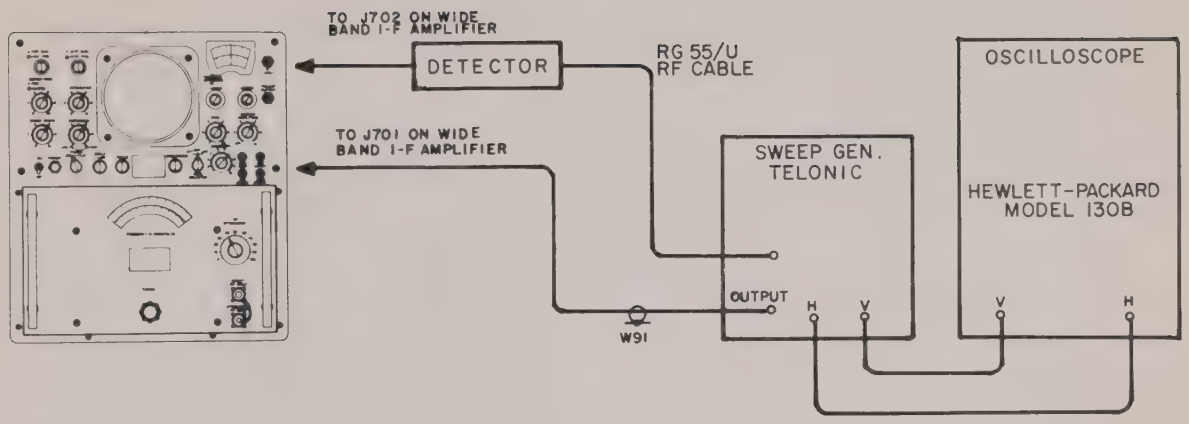



Figure 4-12. Test Setup for Checking and Aligning the Wide Band I-f Amplifier

## 4-27. ALIGNMENT AND CALIBRATION PROCEDURES.

4-28. The alignment and calibration procedures for the Model TSA-W are given in paragraphs 4-29 through 4-35.

4-29. POWER SUPPLY. The dc power necessary for the operation of the Model TSA-W is supplied by the power supply circuits shown in figure 5-3. The high voltage necessary for the operation of the crt is supplied by a separate high voltage power supply, shown in figure 5-4. The outputs of the power supplies, with the exception of the high voltage supply, are made available at jack J124 located at the rear of the basic unit chassis (see figure 4-4). Any of the supplies may be checked by connecting a VTVM between the proper pin of J124 and chassis ground (see table 4-6). The adjustments may be made in any order except for the -1250 and -325 volt adjustments. In this case the -1250 adjustment must be made before the -325 volt adjustment.

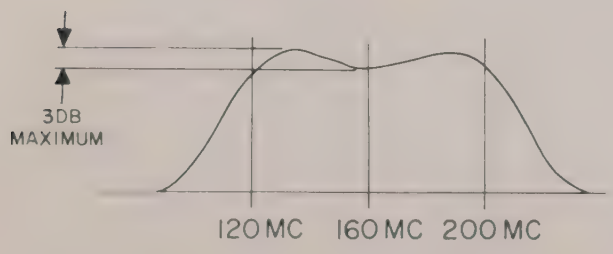



Figure 4-13. Typical Response Curve of the Wide Band I-f Amplifier

4-30. WIDE BAND I-F AMPLIFIER. To check wide band i-f amplifier gain and frequency response, set up the equipment as shown in figure 4-12. Measure the gain of the amplifier over the pass band from 120 to 200 mc. A gain of approximately 25 db at 160 mc indicates satisfactory equipment performance. Failure to obtain this indication shows the need for realignment. Proceed as directed in the following steps:

a. Peak coils L701 through L707 to obtain the response curve shown in figure 4-13.

b. Check the response for a nominal bandwidth of 80 mc (about a center frequency of 160 mc) with a maximum amplitude variation of 3 db over this bandwidth.

c. Disconnect test setup and reconnect cables to J701 and J702.

4-31. SWEEP FREQUENCY GENERATOR. The sweep frequency generator converts the sawtooth output of the phantastron generator into a swept frequency signal centered at 224 mc. A deviation in

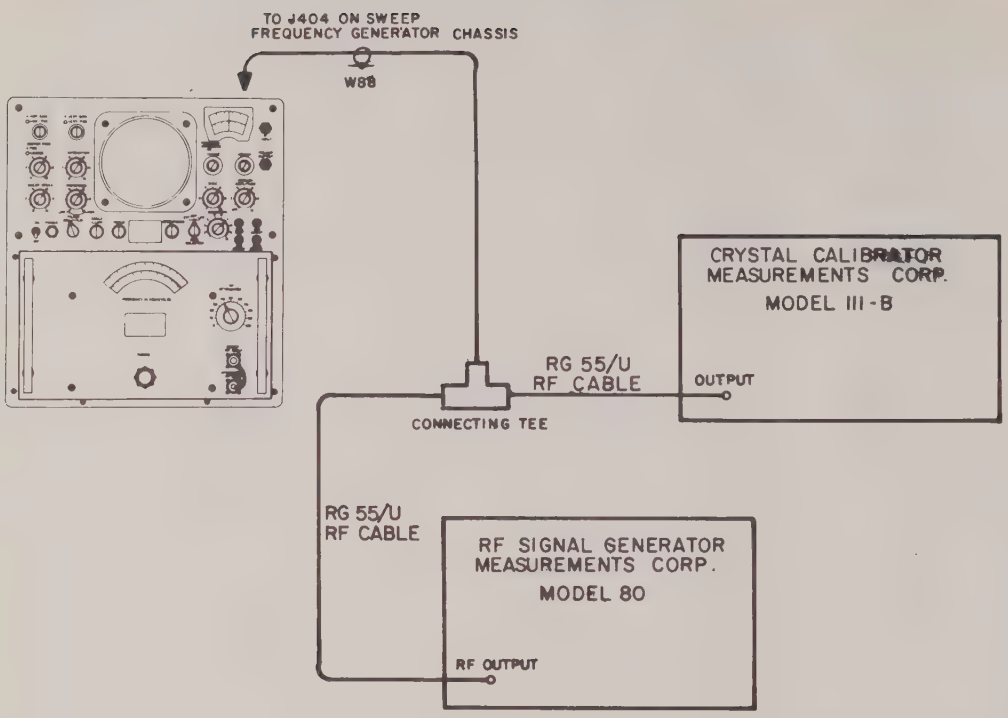



Figure 4-14. Test Setup for Checking and Aligning the Sweep Frequency Generator

linearity of the signal indicates that the sweep frequency generator needs alignment. To align the sweep frequency generator, proceed as follows:

a. Set up the equipment as shown in figure 4-14.

b. Tune the Model 80 to 160 mc and set the DISPERSION switch at High.

c. Adjust L408, L401, and L409 (figure 4-6) for maximum deflection on the CRT.

d. Set the Model 111-B for 10 mc markers.

e. Adjust R403 and CENTER FREQUENCY control for best frequency linearity and proper frequency range as shown in figure 4-15, taking special note of trace foldover.

f. With the CENTER FREQUENCY control adjusted for 160 mc in the center of the trace set the DISPERSION switch to Low.

g. Set the Model 111-B to 1 mc markers.

h. Adjust L406 for best linearity with 160 mc at the center of the trace.

i. Disconnect test setup and reconnect cable to J404.

4-32. NARROW BAND I-F AMPLIFIER. To check the narrow band i-f amplifier, use the test setup of B, figure 4-16. Measure the sensitivity of the amplifier at 64 mc for a 2 cm deflection on the crt, which should be obtained with 150 microvolts input. Failure to obtain the required deflection shows the need for realignment. Proceed as follows:

a. Set up the test equipment as shown in A, figure 4-16.

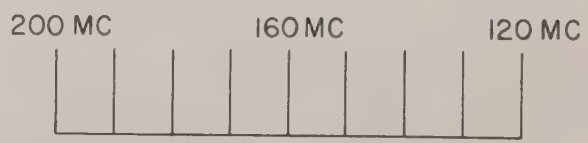
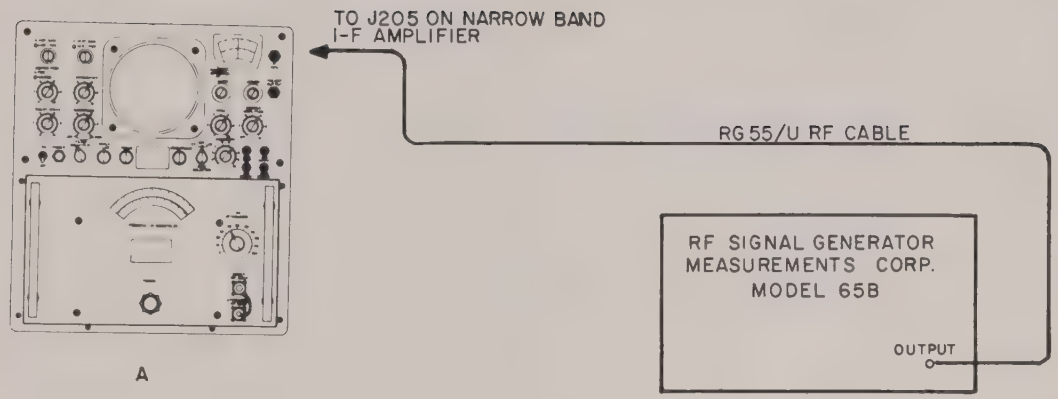



Figure 4-15. Typical Response Curve of Sweep Frequency Generator



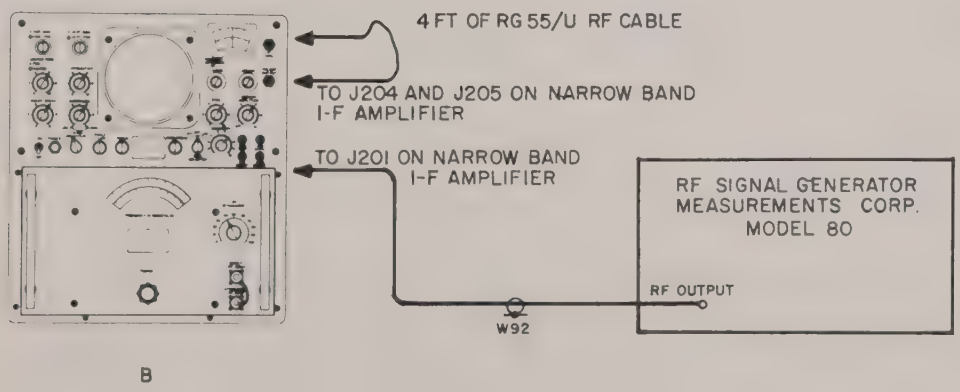




Figure 4-16. Test Setup for Checking and Aligning the Narrow Band I-f Amplifier

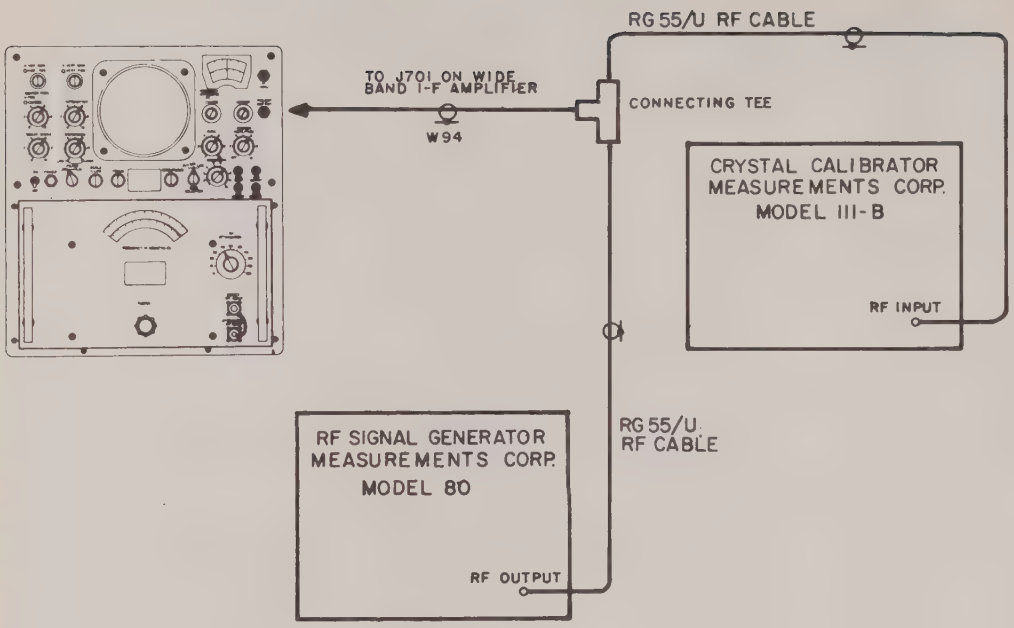



Figure 4-17. Test Setup for Checking and Aligning the Marker Oscillator

b. Set the DISPERSION control at Low.

c. Couple the Model 65B to J205 as shown in figure 4-16. Tune to exactly 500 kc with 30 percent 1000 cps modulation.

d. Adjust L209, L216, L219 (figure 4-5) for maximum display on the CRT.

e. Tune the Model 65B to exactly 6.0 mc with 30 percent 1000 cps modulation. Check frequency with counter.

f. Adjust L213, for maximum display on the CRT.

g. Connect the Model 80 to J201 as shown in B, figure 4-16. Tune to 64 mc with 30 percent 1000 cps modulation.

h. Adjust L225, L205, L202, T201 for maximum display on the CRT.

i. Check the sensitivity of the amplifier for 2 cm of deflection with 150 microvolts input.

j. Disconnect the test setup and reconnect the cables to J204, J205 and J201.

4-33. MARKER OSCILLATOR. To check the performance of the marker oscillator circuit, observe the marker pip on the display of the spectrum analyzer, as follows:

a. Connect the Model 80 and the Model 111-B to J701 of the Wide Band I-F Amplifier, as shown in figure 4-17.

b. Tune the Model 80 to 200 mc, the Model 111-B for 10 mc markers.

c. Observe the screen of the CRT to locate the 120, 160, and 200 mc crystal markers.

d. Use a wax marking pencil to inscribe the location of the 120 and 200 mc markers on the CRT screen.

e. Set the Model 111-B to 1 and mark the location of the 122 and 118 mc markers.

f. Rotate the MARKER AMPLITUDE control to its approximate mid-position. Set the control to obtain convenient height of signal pip.

g. Vary the marker oscillator COARSE control for a reading of plus 40 mc on the FREQUENCY DIFFERENCE MCS dial with FINE control set to 0.

h. If the marker oscillator pip falls between the 118 and 122 mc markers, the marker oscillator circuit is operating satisfactorily at the low end of its frequency excursion.

i. Vary the marker oscillator COARSE control for a reading of minus 40 mc, on the FREQUENCY DIFFERENCE MCS dial.

j. If the marker oscillator pip falls between the 198 and 202 mc markers, the marker oscillator circuit is also operating satisfactorily at the high end of its frequency excursion.

k. In the event that the alignment error of the marker oscillator is greater than 2.0 mc, realignment will be required. Proceed as follows:

(1) Tune the COARSE FREQUENCY DIFFERENCE MCS dial to a reading of plus 40 mc.

(2) Adjust L303 (figure 4-5) until the marker oscillator pip coincides with the plus 40 mc marker.

(3) Tune the COARSE FREQUENCY DIFFERENCE MCS dial to a reading of minus 40 mc.

(4) Adjust C305 until the marker oscillator pip coincides with the minus 40 mc marker.

(5) Alternately adjust the plus and minus limits, steps (1) through (4) until the calibration is correct.

l. Set the COARSE control to 0, the DISPERSION switch to LOW, the Model 111-B to 1 mc.

m. Vary the marker oscillator VERNIER control from -1 to +1 mc comparing the dial and the crystal calibrator markers at -1, 0, and +1. If within 200 kc, no further adjustment is necessary.

n. If greater than 200 kc, adjust C303 until dial is within 200 kc.

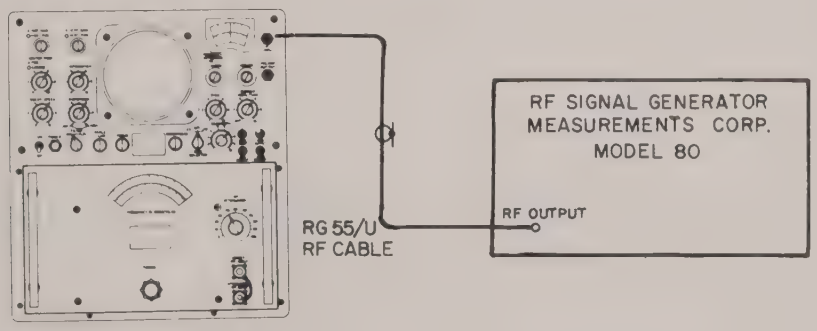
o. Recheck k.

p. Disconnect the test setup and reconnect the cable to J701.

4-34. VARIABLE-BANDWIDTH I-F CONTROL AMPLIFIER. To check and align the variable bandwidth i-f control amplifier proceed as follows:

a. Connect the Model 65B to J205 of the narrow band i-f amplifier.

b. Set the Model 65B to exactly 6 mc at 1000 cps 30 percent modulation. Check this frequency with the Model 524 Counter.



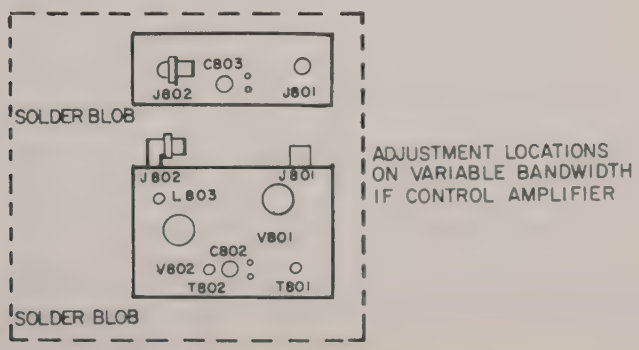




Figure 4-18. Test Setup for Checking and Aligning the Variable Bandwidth I-f Control Amplifier

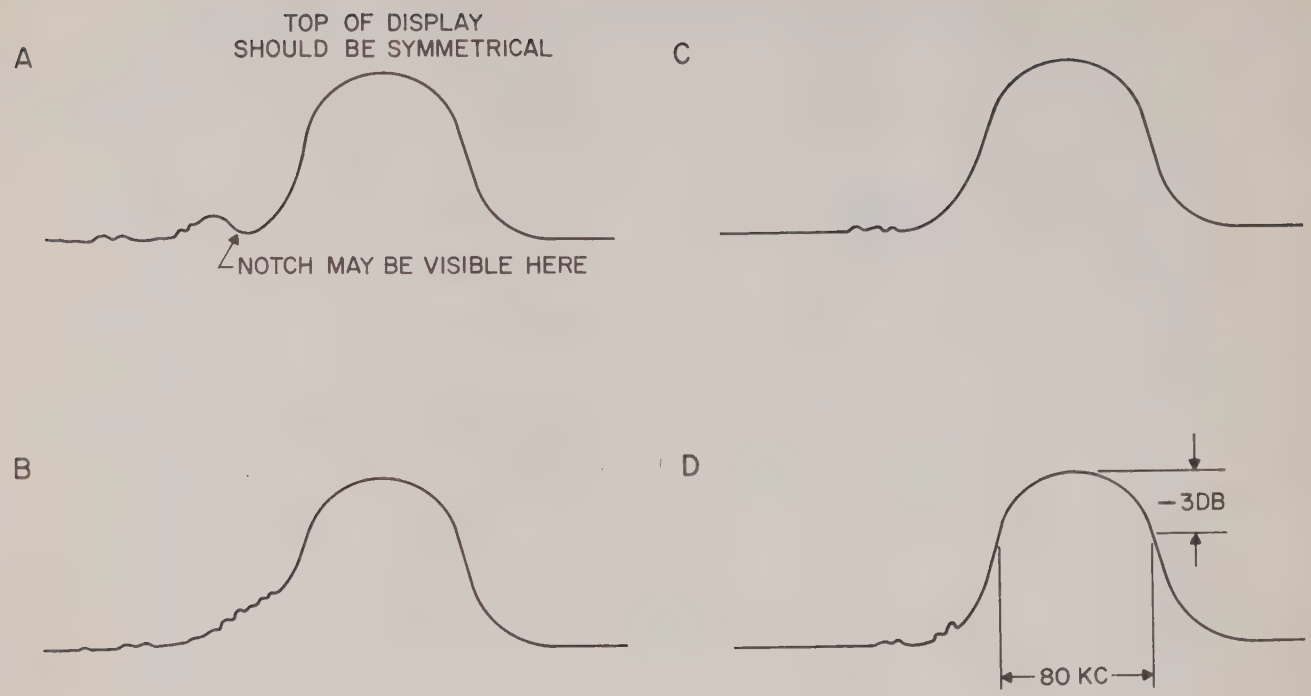



Figure 4-19. Resultant Displays for Variable Bandwidth I-f Amplifier Alignment

c. Adjust L213 for maximum deflection.

d. Disconnect the cable connecting the PREAMP OUTPUT and I-F INPUT connectors on the front panel.

e. Connect the Model 80 to the I-F INPUT connector as shown in figure 4-18.

f. Set the Model 80 to 160 mc.

g. Set C802 and C803 (figure 4-5) to half maximum, as shown by the solder blob locations in figure 4-18.

h. Set L803, T801 and T802 for minimum inductance.

i. Set the BANDWIDTH control to maximum CW position.

j. Set the DISPERSION control to maximum CW position.

k. Adjust the SWEEP SPEED control for a sweep rate of 10 cps.

l. Set the VERT GAIN control to 50 percent of maximum CW position.

m. Increase the input signal from Model 80 until it is visible on the CRT display.

n. Adjust L803 for maximum deflection on the CRT display.

o. Adjust the VERT GAIN control to obtain "one box" of signal.

p. Adjust DISPERSION control for 300 kc/s dispersion.

q. Adjust T801 and T802 alternately for minimum deflection on CRT display.

r. Adjust rf input signal, and, if necessary, VERT GAIN control to obtain "3 boxes" of signal.

s. Adjust C802 and C803 for minimum amplitude of the irregularities and notch as shown in B, figure 4-19.

t. Adjust L803 for maximum output with symmetrical response as shown in C, figure 4-19.

u. Set BANDWIDTH control to maximum CCW.

v. Adjust L213 in the narrow band i-f amplifier for maximum deflection on the CRT.

w. Reset C802, C803, T801, and T802, if necessary, to obtain the display shown in D, figure 4-19 with BANDWIDTH control to maximum CW. Disconnect the test setup and reconnect the cable on the front panel from PREAMP OUTPUT connector to I-F INPUT connector.

4-35. VIDEO AMPLIFIER. To check the video chassis, perform the following measurements and, if needed, the following adjustments: (See figure 4-7).

a. Measure with a VTVM from terminal 2 of R508 to ground. If zero volts DC is not indicated, adjust R508.

b. Connect the audio oscillator to J502 and place the LOG-FILTER-LIN switch in LIN position. Set the oscillator frequency for 1000 cps and the output for 4.5 volts peak-to-peak. Adjust R512 to obtain a peak-to-peak deflection of 10 cm on the CRT.

c. Turn the VERT GAIN control fully counter-clockwise and place the LOG-FILTER-LIN switch to LIN. Observe the base line on the CRT.

d. Place the LOG-FILTER-LIN switch to LOG. The base line should remain in the same position observed in step c.

e. If this indication is not obtained, adjust R555 to return the base line to the same position observed in step c.

f. Set the controls of the spectrum analyzer for and 80 mc dispersion and observe the CRT for retrace and signal foldover. If needed, adjust R515 (figure 4-7) so that no retrace of signal foldover appears on the screen. Do not overblank.

g. With the DISPERSION HIGH-LOW switch in HIGH position and the DISPERSION control maximum clockwise, check the dispersion with the marker oscillator. If it is not 80 mc, adjust R536 for 80 mc dispersion.

h. With the DISPERSION HIGH-LOW switch in LOW position and the DISPERSION control maximum clockwise, check the dispersion with the marker oscillator. If it is not 10 mc, adjust R537 for 10 mc dispersion.

i. With the spectrum analyzer set for an 80 mc dispersion, and the FREQUENCY DIFFERENCE MCS dials set at zero, check to determine if the full range of the CENTER FREQUENCY control moves the marker to each side of the screen. If this indication is not obtained, adjust R585 and R587.

j. Inject a 500 kc signal from the Model 65B Signal Generator into J502 and adjust C512 for minimum deflection on the screen of the cathode-ray tube.

4-36. Log Output Zero Adjustment.

4-37. Connect the VTVM to the LOG OUTPUT jack on the front panel and measure the DC voltage. If it is not zero VDC, adjust R549 for zero VDC.

4-38. Video Zero Adjustment.

4-39. Connect the VTVM to the VIDEO OUTPUT jack on the front panel and measure the DC voltage. If it is not zero VDC, adjust R511 for zero VDC.

## 4-40. LUBRICATION.

4-41. The Model TSA-W requires no lubrication other than that applied at the time of manufacture.

# SECTION V

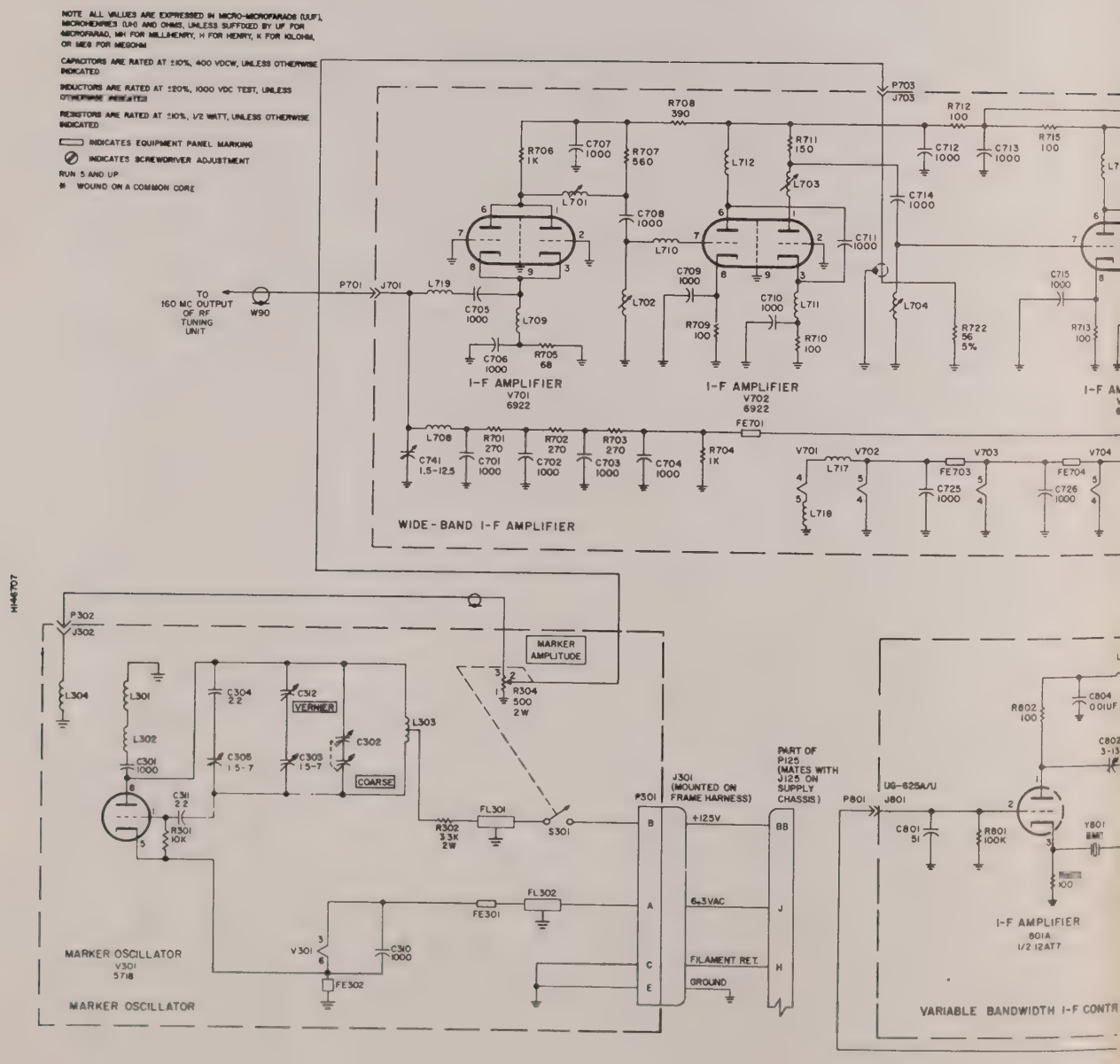
# DIAGRAMS

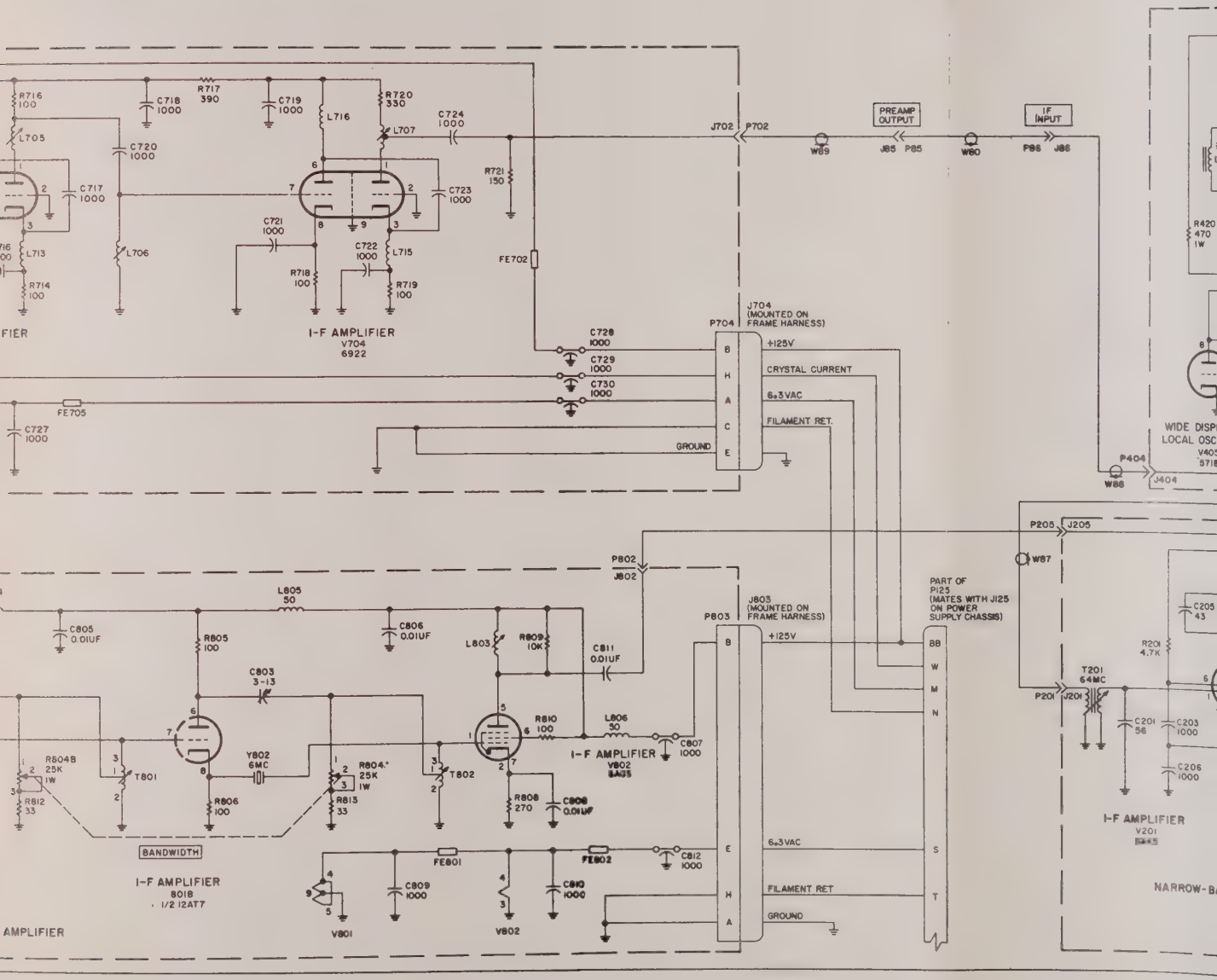
## 5-1. SCOPE.

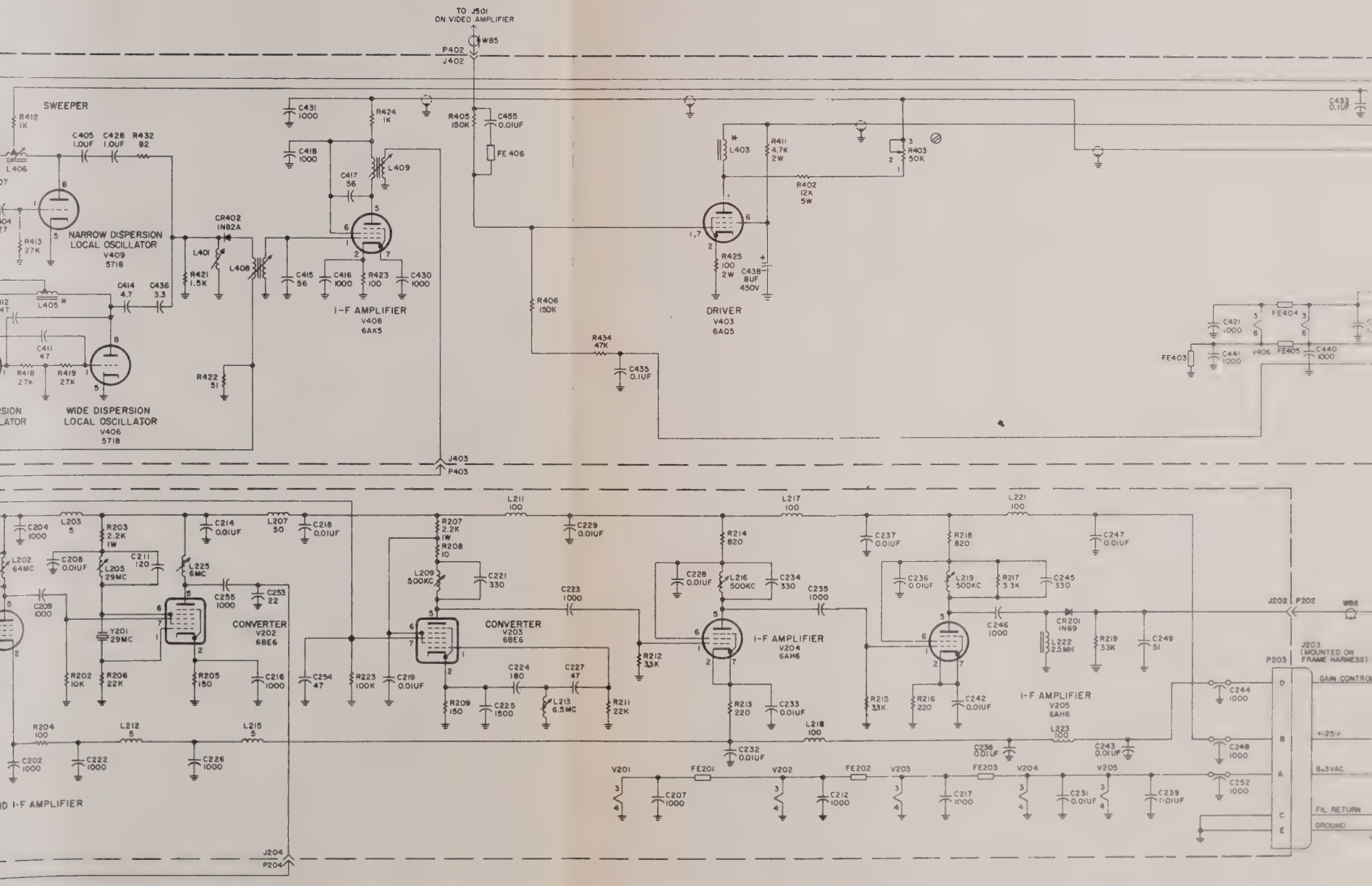
5-2. This section contains diagrams and tables which are essential aids to the maintenance of the Model TSA-W. Included in this section are the cabling and schematic diagrams, and voltage and resistance tables.

5-3. The schematic diagrams, figures 5-1 through 5-5, show the entire circuitry comprising the Model DU-2A Basic Unit. Figures 5-6 through 5-10 show the circuitry comprising Tuning Units Models STU-1WA, STU-2WA, STU-3WA, STU-4WA and STU-5WA, respectively. The diagrams should be used in conjunction with Section III to help the technician understand the operation of the equipment. The diagrams should be used in conjunction with Section IV to facilitate signal tracing and continuity testing during maintenance operations.

5-4. Voltage and resistance tables 5-1 through 5-13 should be used in conjunction with troubleshooting table 4-4 to aid in locating defective components in malfunctioning or inoperative circuits.


NOTE ALL VALUES ARE EXPRESSED IN MICRO-MICROFARADS (UUF), MICROHENRIES (UH) AND OHMS, UNLESS SUFFIXED BY UF FOR MICROFARAD, MH FOR MILLIHENRY, H FOR HENRY, K FOR KILOHM, OR MEG FOR MEGOHM
CAPACITORS ARE RATED AT ±10%, 400 VDCW, UNLESS OTHERWISE INDICATED
INDUCTORS ARE RATED AT ±20%, 1000 VDC TEST, UNLESS OTHERWISE INDICATED
RESISTORS ARE RATED AT ±10%, 1/2 WATT, UNLESS OTHERWISE INDICATED
INDICATES EQUIPMENT PANEL MARKING
INDICATES SCREWDRIVER ADJUSTMENT
RUN 5 AND UP
# WOUND ON A COMMON CORE
H46707
TO 160 MC OUTPUT OF RF TUNING UNIT
W90
P701
J701
L719
C705 1000
L709
C706 1000
R705 68
I-F AMPLIFIER V701 6922
P703 J703
R708 390
R706 1K
C707 1000
R707 560
L701
C708 1000
L710
C709 1000
R709 100
L702
L712
R711 150
L703
C710 1000
L711
R710 100
I-F AMPLIFIER V702 6922
C711 1000
C712 1000
C713 1000
R715 100
C714 1000
L704
R722 56 5%
C715 1000
R713 100
FE701
L708
C741 1.5-12.5
R701 270
C701 1000
R702 270
C702 1000
R703 270
C703 1000
C704 1000
R704 1K
WIDE-BAND I-F AMPLIFIER
V701
L717
L718
V702
FE703
C725 1000
V703
FE704
C726 1000
V704
P302 J302
L304
L301
L302
C301 1000
C304 22
C305 15-7
C312 VERNIER
C303 15-7
C302 COARSE
L303
MARKER AMPLITUDE
R304 500 2W
C311 22
R301 10K
R302 33K 2W
FL301
S301
P301
J301 (MOUNTED ON FRAME HARNESS)
PART OF P125 (MATES WITH J125 ON SUPPLY CHASSIS)
+125V
BB
6.3VAC
J
FILAMENT RET.
H
GROUND
FL302
FE301
FE302
C310 1000
V301
MARKER OSCILLATOR V301 5718
MARKER OSCILLATOR
P801
J801
UG-625A/U
C801 51
R801 100K
R802 100
C804 0.01UF
C803 3-13
Y801
100
I-F AMPLIFIER 801A 1/2 12AT7
VARIABLE BANDWIDTH I-F CONTR


R716 100
C718 1000
R717 390
C719 1000
L716
R720 330
C724 1000
L705
L707
C720 1000
C717 1000
L713
L706
R714 100
C721 1000
C722 1000
L715
R718 100
R719 100
C723 1000
R721 150
FE702
I-F AMPLIFIER
V704
6922
J702
P702
W89
PREAMP OUTPUT
J85
P85
W80
P86
J86
IF INPUT
C728 1000
C729 1000
C730 1000
FE705
C727 1000
P704
J704 (MOUNTED ON FRAME HARNESS)
+125V
CRYSTAL CURRENT
6.3VAC
FILAMENT RET.
GROUND
P404
J404
W88
WIDE DISP
LOCAL OSC
P802
J802
L805 50
C805 0.01UF
C806 0.01UF
R805 100
C803 3-13
L803
R809 10K
C811 0.01UF
P803
J803 (MOUNTED ON FRAME HARNESS)
PART OF P125 (MATES WITH J125 ON POWER SUPPLY CHASSIS)
BB
W
M
N
S
T
P205
J205
W87
P201
J201
T201 6.4MC
R201 4.7K
C205 43
C201 56
C203 1000
C206 1000
R810 100
L806 50
C807 1000
R804B 25K 1W
T801
Y802 6MC
R804A 25K 1W
R813 33
T802
R808 270
C808 0.01UF
R812 33
R806 100
BANDWIDTH
I-F AMPLIFIER
8018
1/2 12AT7
V801
V802
FE801
FE802
C812 1000
C809 1000
C810 1000
6.3VAC
FILAMENT RET
GROUND
I-F AMPLIFIER
V802
6AU5
I-F AMPLIFIER
V201
6AU5
NARROW-B
AMPLIFIER


TO J501
ON VIDEO AMPLIFIER
W85
P402
J402
SWEEPER
R412 1K
C405 1.0UF
C428 1.0UF
R432 82
L406
R413 27K
NARROW DISPERSION
LOCAL OSCILLATOR
V409
5718
C414 4.7
C436 3.3
L405
C411 47
R418 27K
R419 27K
WIDE DISPERSION
LOCAL OSCILLATOR
V406
5718
R422 51
CR402 1N82A
L401
R421 1.5K
L408
C431 1000
R424 1K
C418 1000
C417 56
L409
C415 56
C416 1000
R423 100
C430 1000
I-F AMPLIFIER
V408
6AK5
R405 150K
C455 0.01UF
FE 406
L403
R411 4.7K 2W
R403 50K
R402 12K 5W
R425 100 2W
C438 8UF 450V
DRIVER
V403
6AQ5
R406 150K
R434 47K
C435 0.1UF
C433 0.1UF
FE404
C421 1000
FE403
C441 1000
V406
FE405
C440 1000
J403
P403
L202 64MC
C204 1000
L203 5
R203 2.2K 1W
C208 0.01UF
C211 120
L205 29MC
C209 1000
Y201 29MC
CONVERTER
V202
6BE6
C255 1000
C253 22
L225 6MC
R202 10K
R206 22K
R205 150
C216 1000
C214 0.01UF
L207 50
C218 0.01UF
C254 47
R223 100K
C219 0.01UF
R207 2.2K 1W
R208 10
L209 500KC
C221 330
C223 1000
CONVERTER
V203
6BE6
C224 180
C227 47
R209 150
C225 1500
L213 6.5MC
R211 22K
L211 100
C229 0.01UF
R212 33K
R214 820
C228 0.01UF
L216 500KC
C234 330
C235 1000
I-F AMPLIFIER
V204
6AH6
C232 0.01UF
R213 220
C233 0.01UF
L217 100
C237 0.01UF
R218 820
C236 0.01UF
L219 500KC
R217 3.3K
C245 330
C246 1000
CR201 1N69
L222 2.5MH
R219 33K
C249 51
I-F AMPLIFIER
V205
6AH6
R215 33K
R216 220
C242 0.01UF
L218 100
L221 100
C247 0.01UF
L223 100
C238 0.01UF
C243 0.01UF
J202
P202
W86
J203
(MOUNTED ON
FRAME HARNESS)
P203
C244 1000
C248 1000
C252 1000
GAIN CONTROL
+125 V
6.3VAC
FIL RETURN
GROUND
D
B
A
C
E
V201
FE201
C207 1000
V202
FE202
C212 1000
V203
FE203
C217 1000
V204
C231 0.01UF
V205
C239 0.01UF
R204 100
L212 5
L215 5
C202 1000
C222 1000
C226 1000
D I-F AMPLIFIER
J204
P204

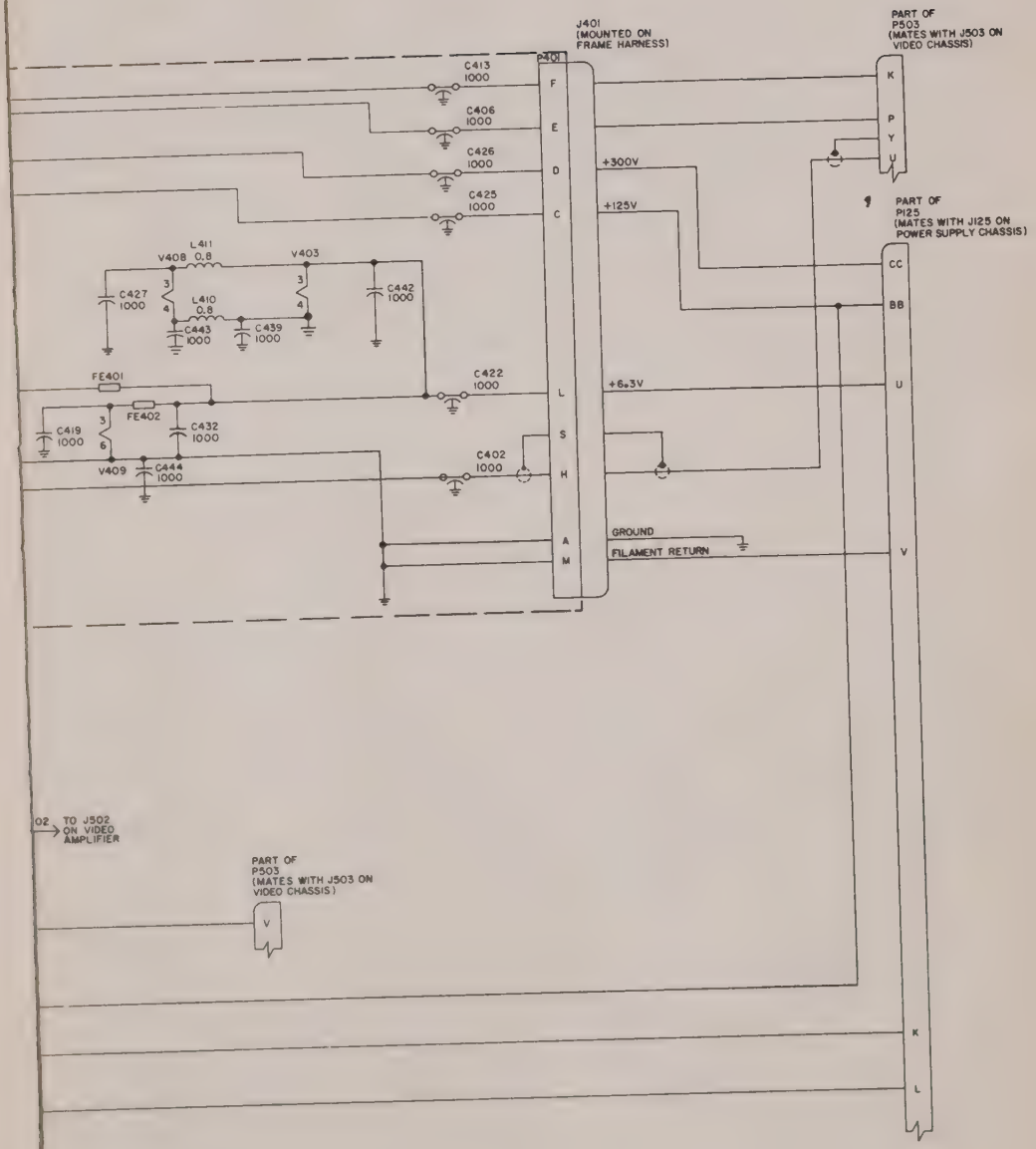
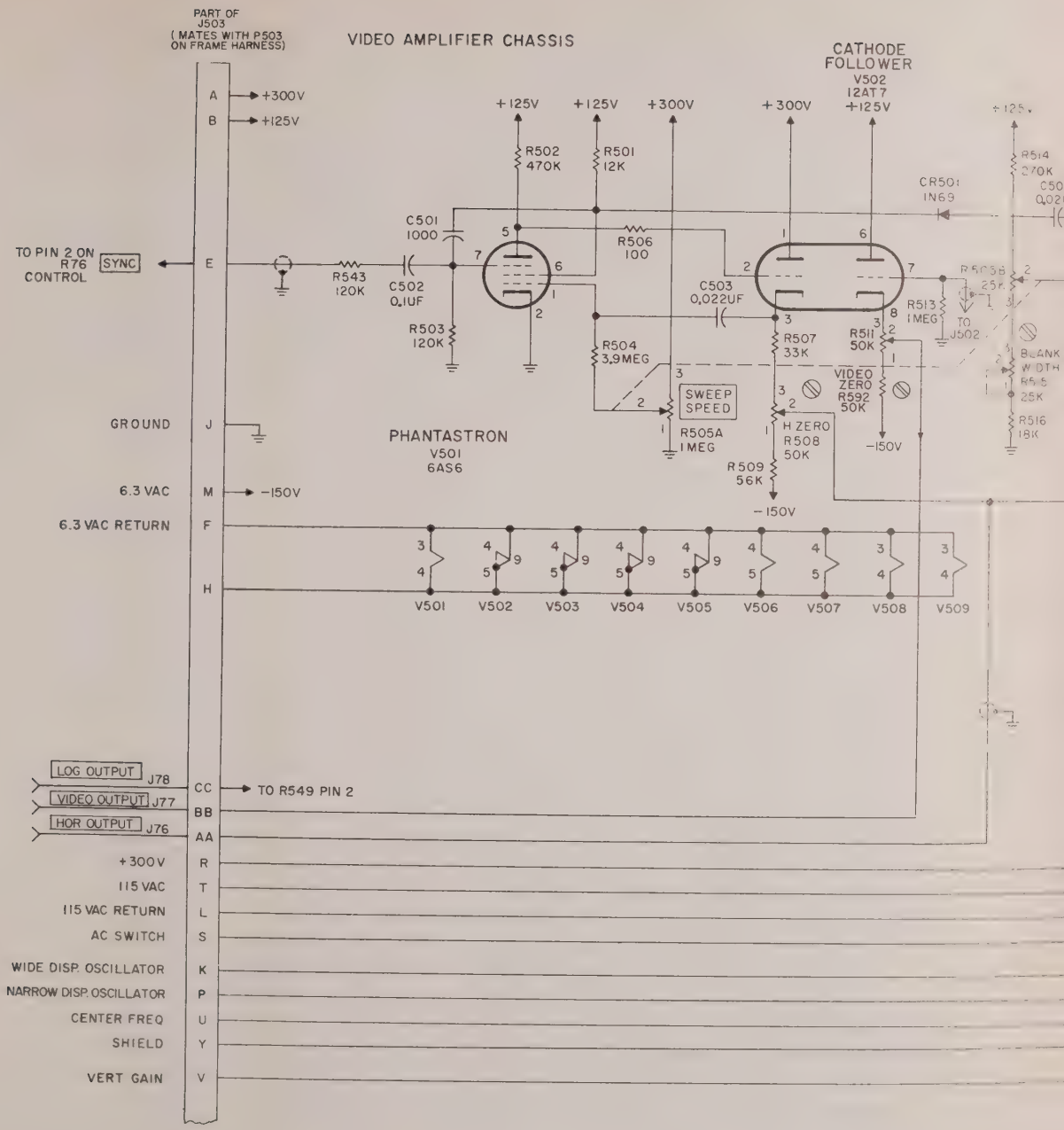



Figure 5-1. Model TSA-W Display Unit, Schematic Diagram

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CAPACITORS ARE RATED AT ±10%, 400 VDCW, UNLESS OTHERWISE INDICATED

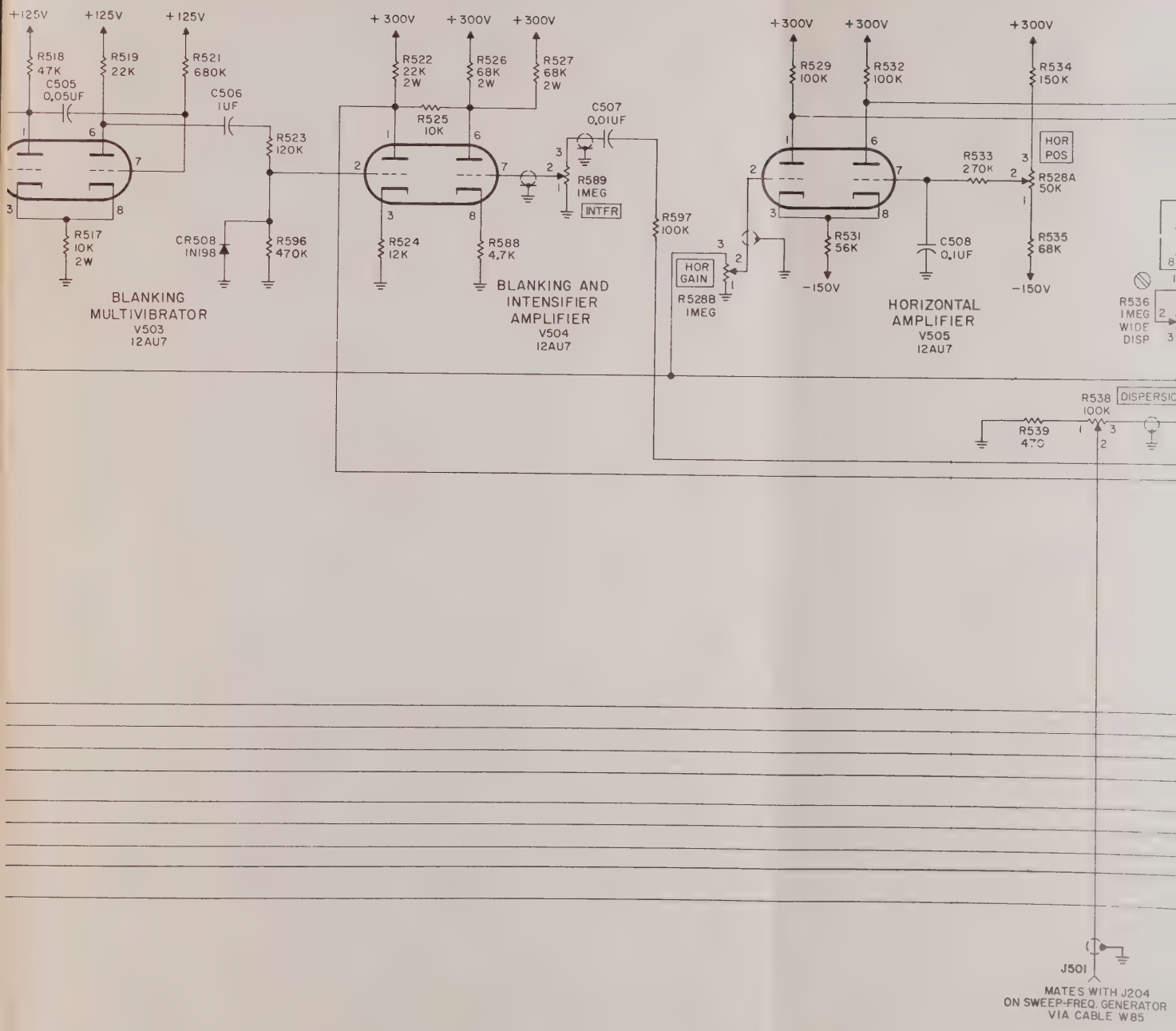
INDUCTORS ARE RATED AT ±20%, 1000 VDC TEST, UNLESS OTHERWISE INDICATED

RESISTORS ARE RATED AT ±10%, 1/2 WATT, UNLESS OTHERWISE INDICATED

▭ INDICATES EQUIPMENT PANEL MARKING

⊘ INDICATES SCREWDRIVER ADJUSTMENT

RUN 5 AND UP


+125V
+125V
+125V
R518
47K
C505
0.05UF
R519
22K
R521
680K
C506
1UF
R523
120K
R517
10K
2W
CR508
IN198
R596
470K
BLANKING
MULTIVIBRATOR
V503
12AU7
+300V
+300V
+300V
R522
22K
2W
R526
68K
2W
R527
68K
2W
R525
10K
C507
0.01UF
R589
1MEG
INTFR
R524
12K
R588
4.7K
BLANKING AND
INTENSIFIER
AMPLIFIER
V504
12AU7
R597
100K
HOR
GAIN
R528B
1MEG
+300V
+300V
+300V
R529
100K
R532
100K
R534
150K
R533
270K
HOR
POS
R528A
50K
R531
56K
C508
0.1UF
R535
68K
-150V
-150V
HORIZONTAL
AMPLIFIER
V505
12AU7
R536
1MEG
WIDE
DISP
R538
100K
DISPERSIO
R539
470
J501
MATES WITH J204
ON SWEEP-FREQ. GENERATOR
VIA CABLE W85

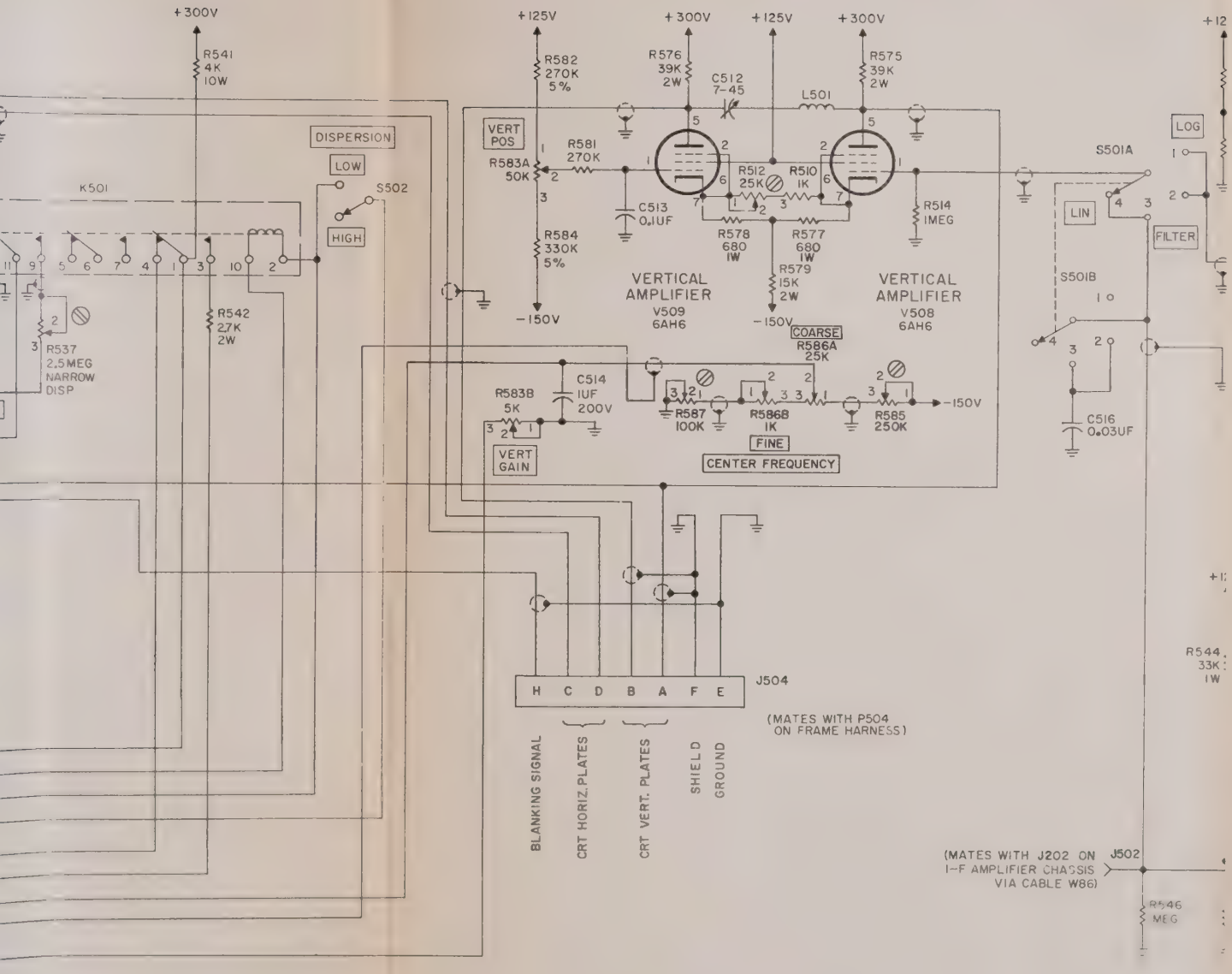
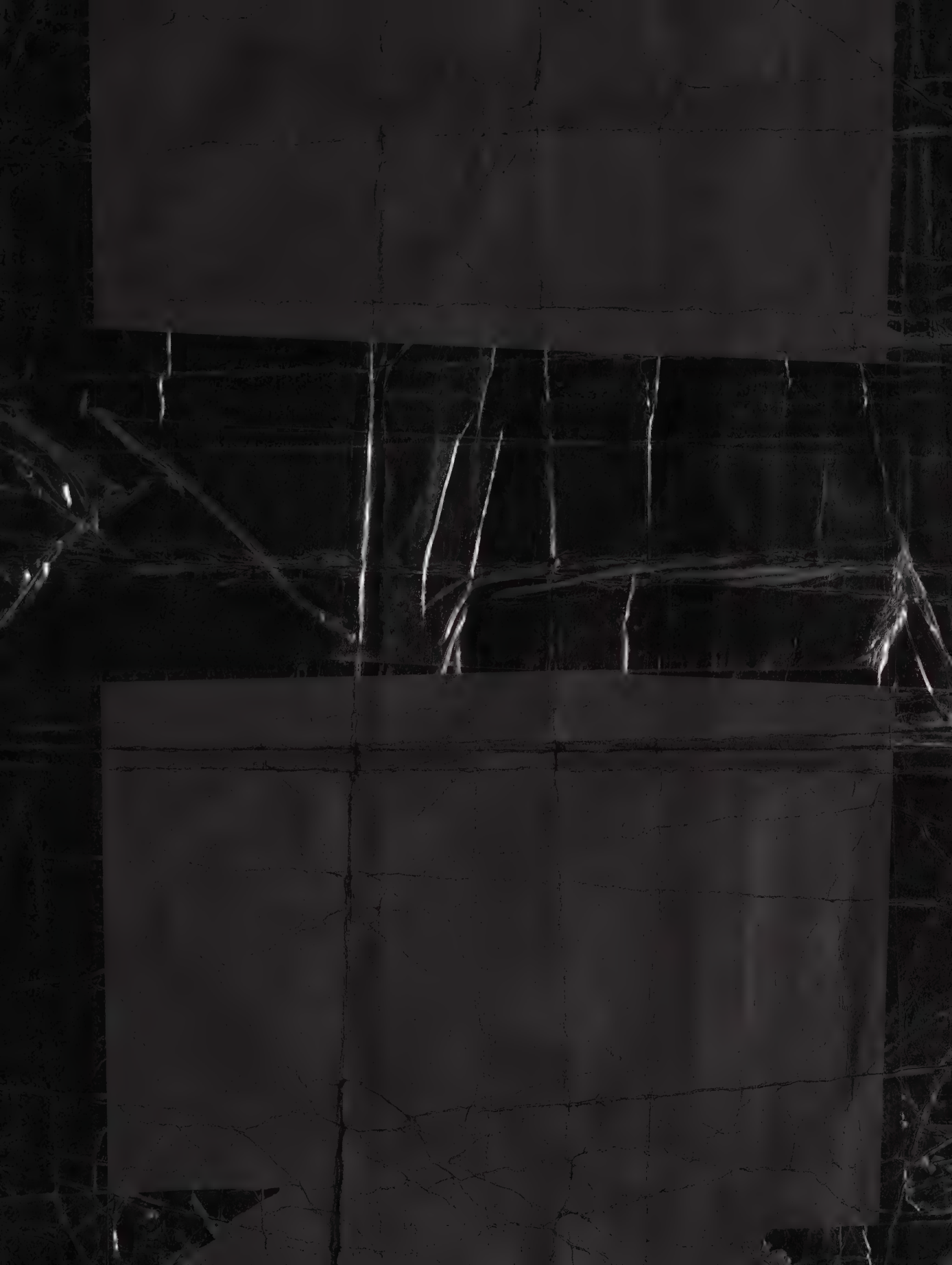
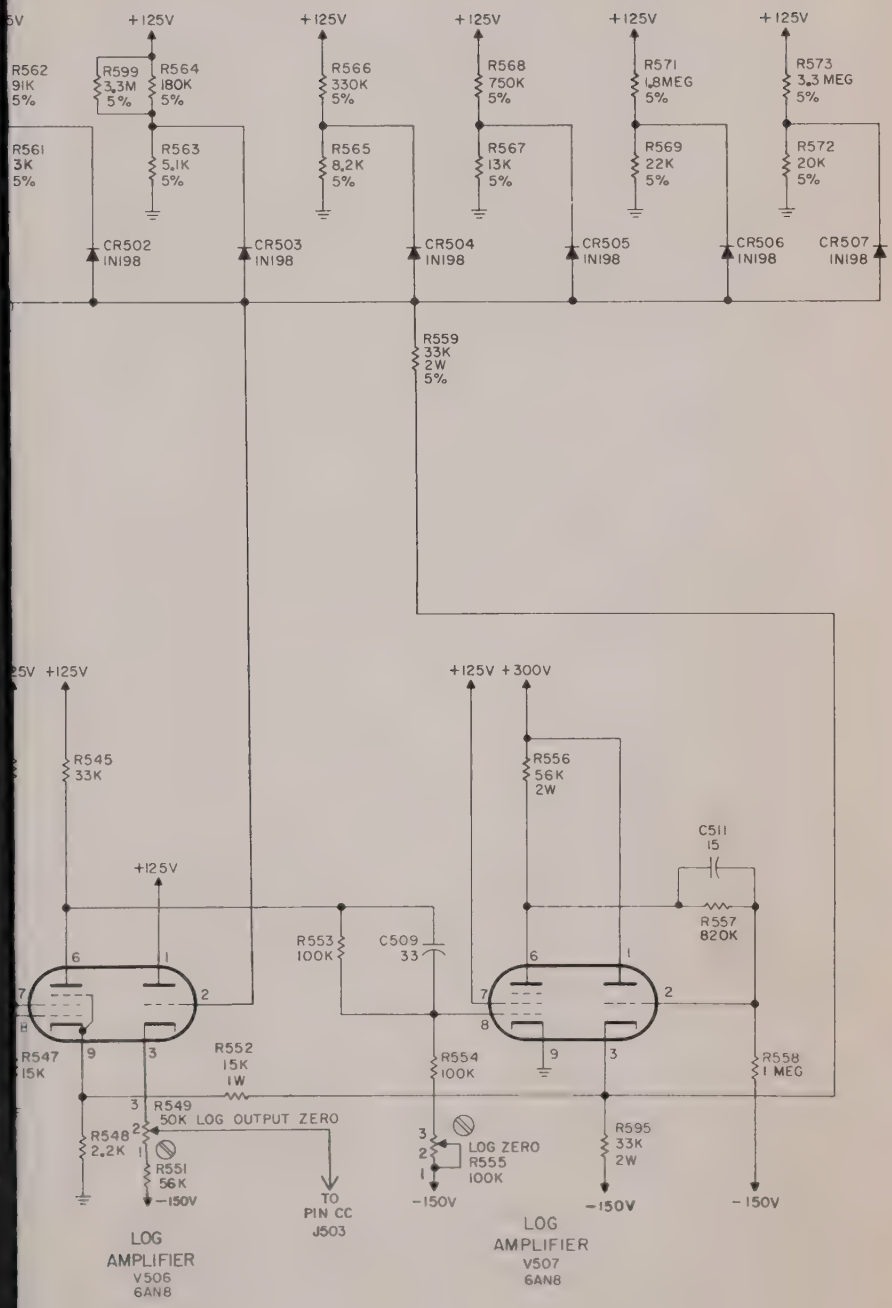
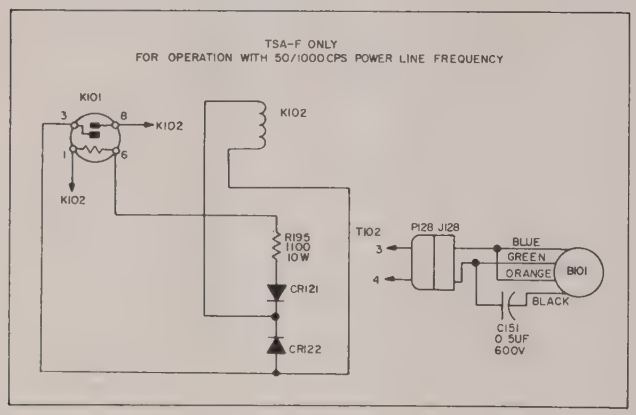

+300V
R541
4K
10W
DISPERSION
LOW
HIGH
S502
K501
R542
27K
2W
R537
2.5MEG
NARROW
DISP
+125V
R582
270K
5%
VERT
POS
R581
270K
R583A
50K
R584
330K
5%
-150V
+300V
R576
39K
2W
C512
7-45
+125V
+300V
R575
39K
2W
L501
C513
0.1UF
R512
25K
R510
1K
R578
680
1W
R577
680
1W
R579
15K
2W
R514
1MEG
VERTICAL
AMPLIFIER
V509
6AH6
VERTICAL
AMPLIFIER
V508
6AH6
-150V
COARSE
R586A
25K
C514
1UF
200V
R583B
5K
VERT
GAIN
R587
100K
R586B
1K
FINE
R585
250K
-150V
CENTER FREQUENCY
S501A
LOG
LIN
FILTER
S501B
C516
0.03UF
+12
R544
33K
1W
J504
H C D B A F E
(MATES WITH P504
ON FRAME HARNESS)
BLANKING SIGNAL
CRT HORIZ. PLATES
CRT VERT. PLATES
SHIELD
GROUND
(MATES WITH J202 ON
I-F AMPLIFIER CHASSIS
VIA CABLE W86)
J502
R546
MEG

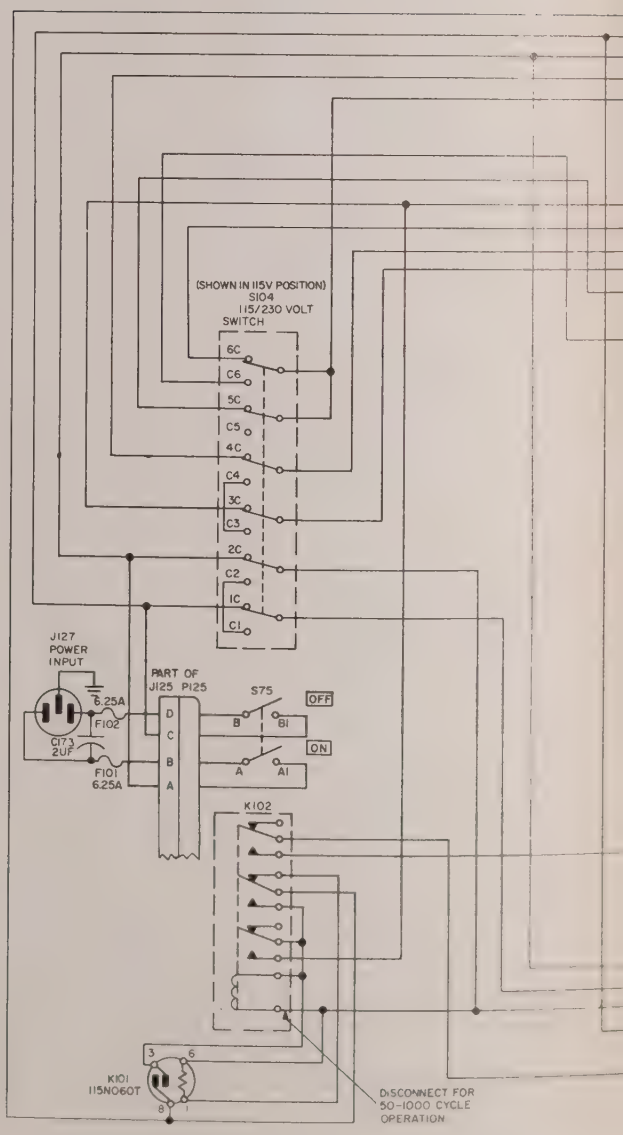
Figure 5-






2. Model TSA-W Video Chassis, Schematic Diagram




D1291334

NOTE ALL VALUES ARE EXPRESSED IN MICRO MICROFARADS (UUF), MICROHENRIES (UH) AND OHMS, UNLESS SUFFIXED BY UF FOR MICROFARAD, MH FOR MILLIHENRY, H FOR HENRY, K FOR KILOHM, OR MEG FOR MEGOHM

CAPACITORS ARE RATED AT ±10%, 400 VDCW, UNLESS OTHERWISE INDICATED

INDUCTORS ARE RATED AT ±20%, 1000 VDC TEST, UNLESS OTHERWISE INDICATED

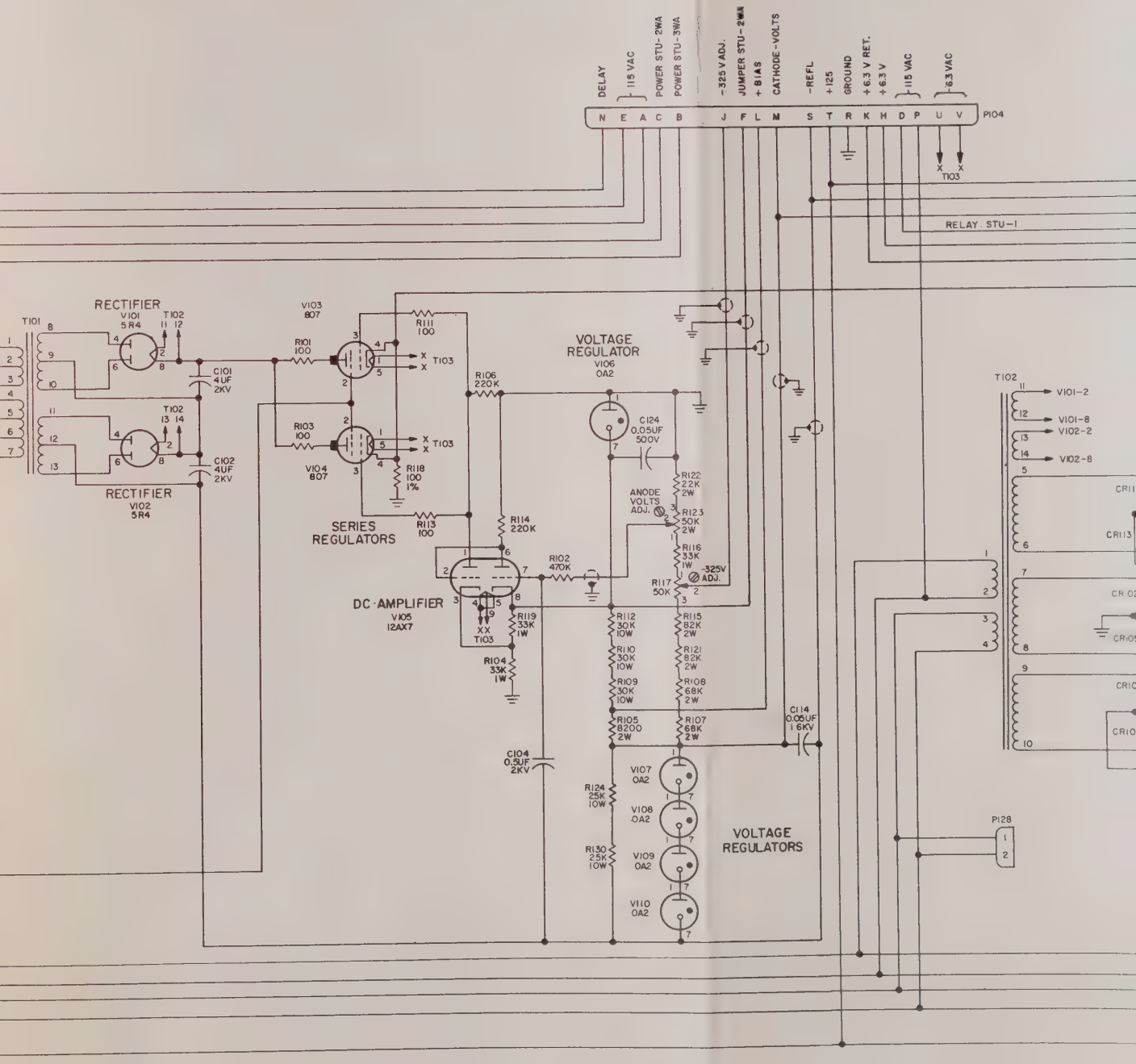
RESISTORS ARE RATED AT ±10%, 1/2 WATT, UNLESS OTHERWISE INDICATED

[ ] INDICATES EQUIPMENT PANEL MARKING

⊕ INDICATES SCREWDRIVER ADJUSTMENT

TSA RUN 3 AND UP

TSA-W RUN 5 AND UP


DELAY
115 VAC
POWER STU-2WA
POWER STU-3WA
-325 V ADJ.
JUMPER STU-2WA
+ BIAS
CATHODE-VOLTS
-REFL
+125
GROUND
+6.3 V RET.
+6.3 V
115 VAC
6.3 VAC
N E A C B J F L M S T R K H D P U V
P104
T103
RELAY: STU-1
RECTIFIER
T101
V101 5R4
T102
C101 4UF 2KV
C102 4UF 2KV
RECTIFIER
V102 5R4
V103 807
R101 100
R103 100
V104 807
R111 100
R118 100 1%
SERIES REGULATORS
R113 100
R106 220K
R114 220K
VOLTAGE REGULATOR
V106 0A2
C124 0.05UF 500V
R122 22K 2W
ANODE VOLTS ADJ.
R123 50K 2W
R116 33K 1W
-325V ADJ.
R117 50K
R102 470K
DC AMPLIFIER
V105 12AX7
R119 33K 1W
R104 33K 1W
R112 30K 10W
R110 30K 10W
R109 30K 10W
R105 8200 2W
R115 82K 2W
R121 82K 2W
R108 68K 2W
R107 68K 2W
C114 0.05UF 16KV
C104 0.5UF 2KV
R124 25K 10W
R130 25K 10W
V107 0A2
V108 0A2
V109 0A2
V110 0A2
VOLTAGE REGULATORS
T102
V101-2
V101-8
V102-2
V102-8
CR11
CR113
P128

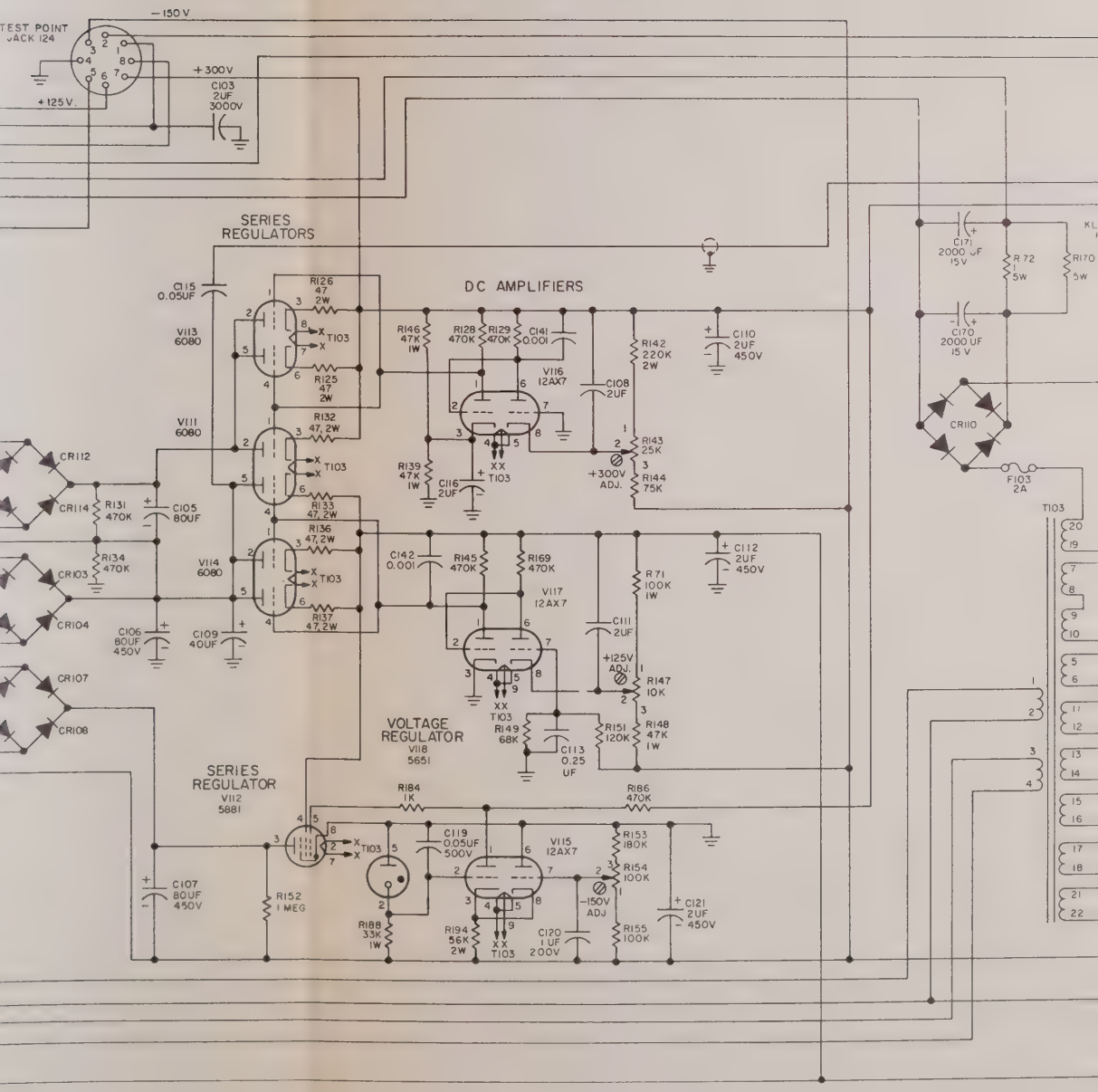
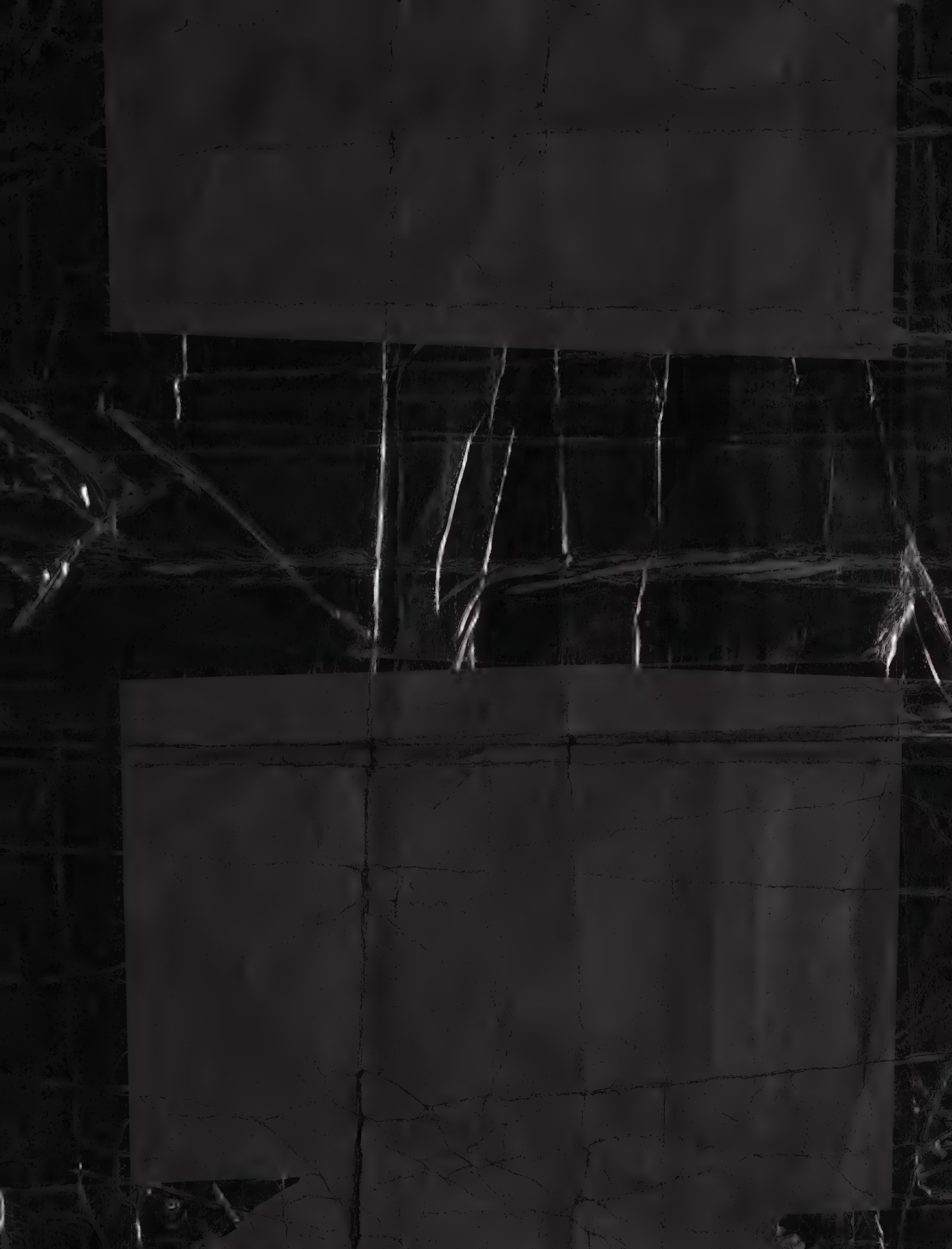
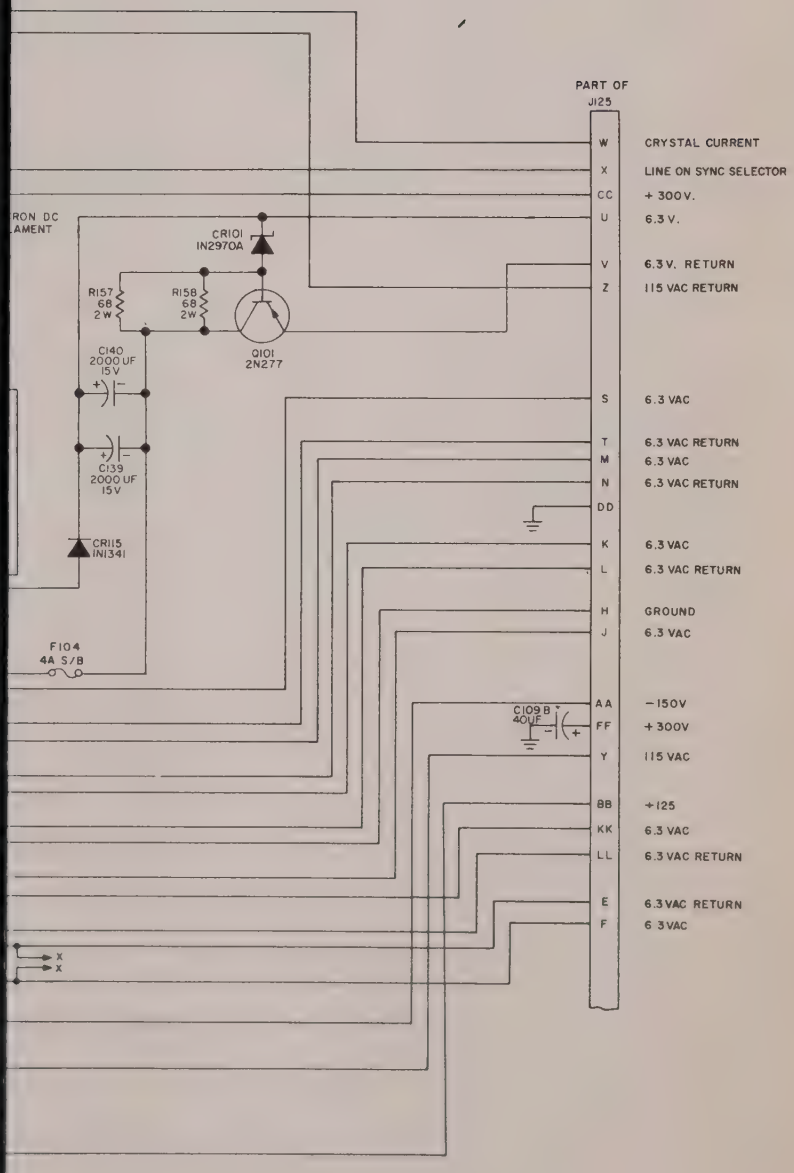



Figure 5-3. Klystron






nd Low Voltage Power Supply, Schematic Diagram

NOTE: ALL VALUES ARE EXPRESSED IN MICRO-MICROFARADS (UUF), MICROHENRIES (UH) AND OHMS, UNLESS SUFFIXED BY UF FOR MICROFARAD, MH FOR MILLIHENRY, H FOR HENRY, K FOR KILOHM, OR MEG FOR MEGOHM.

CAPACITORS ARE RATED AT ±10%, 400 VDCW, UNLESS OTHERWISE INDICATED.

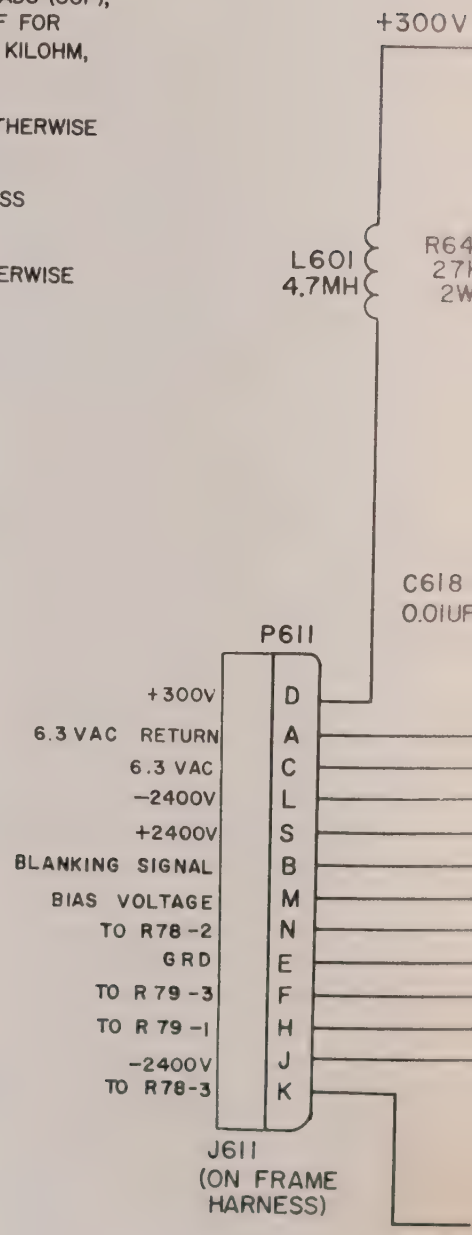
INDUCTORS ARE RATED AT ±20%, 1000 VDC TEST, UNLESS OTHERWISE INDICATED.

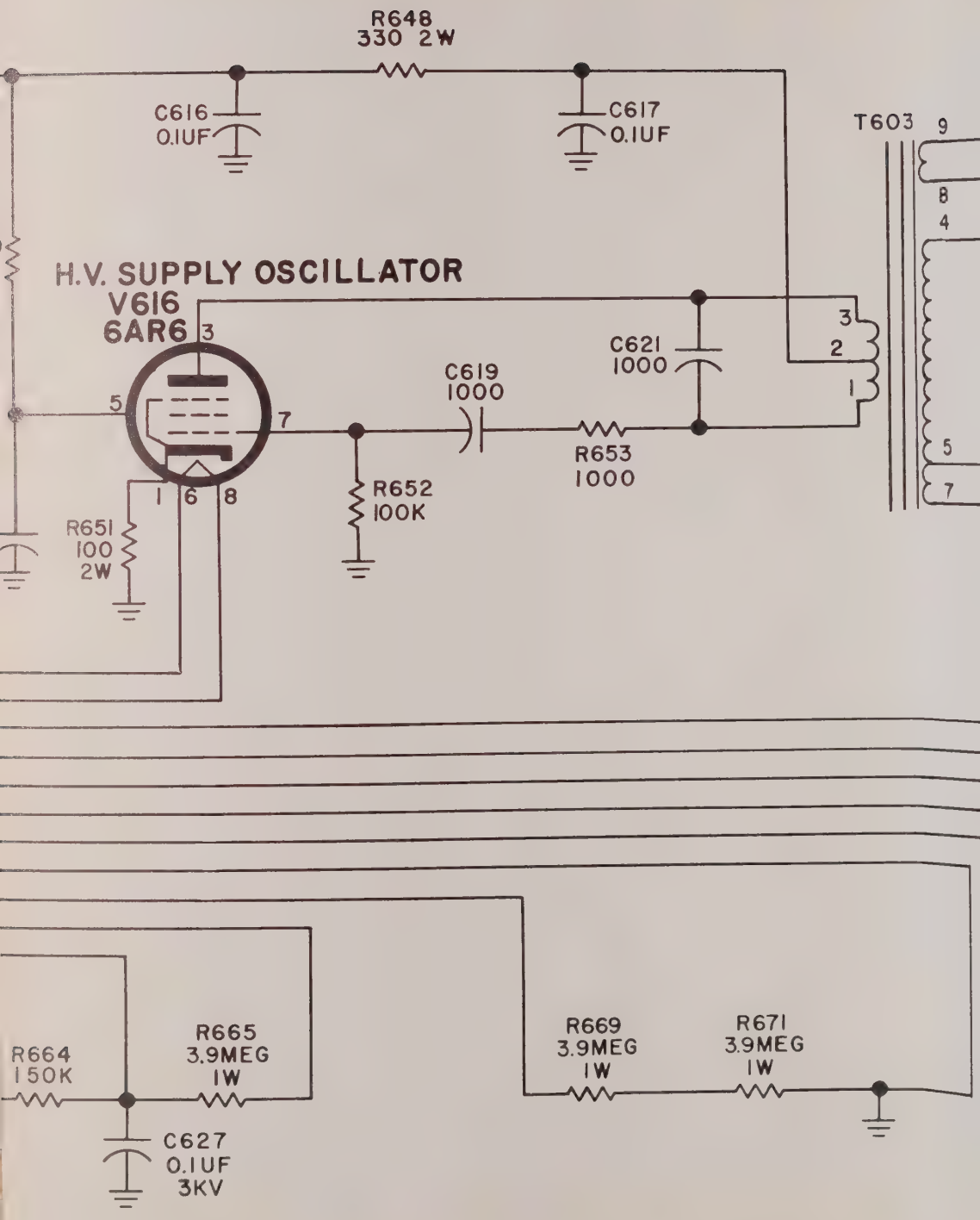
RESISTORS ARE RATED AT ±10%, 1/2 WATT, UNLESS OTHERWISE INDICATED.

▭ INDICATES EQUIPMENT PANEL MARKING.

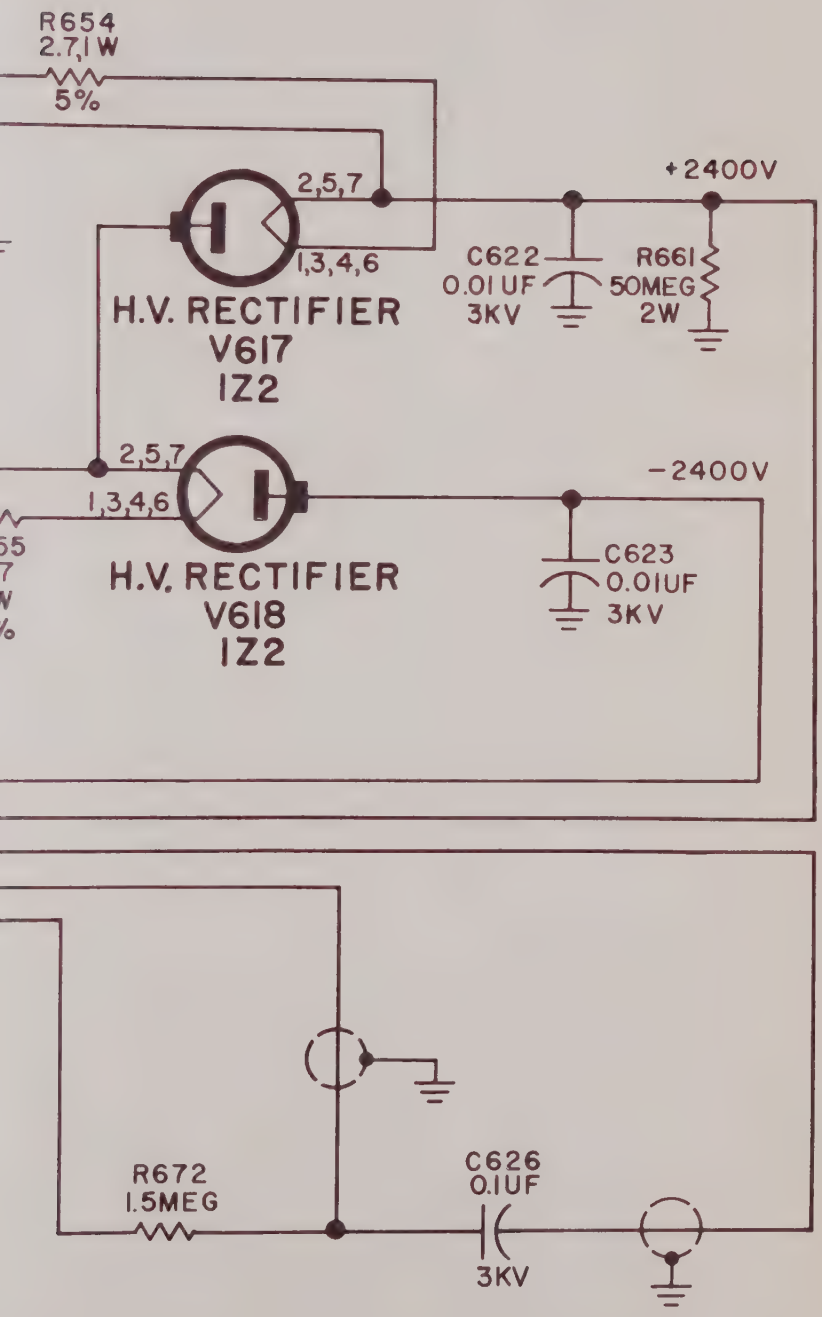
⊘ INDICATES SCREWDRIVER ADJUSTMENT.

8130 RUN 6 AND UP
8120 RUN 5 AND UP
8100 RUN 3 AND UP

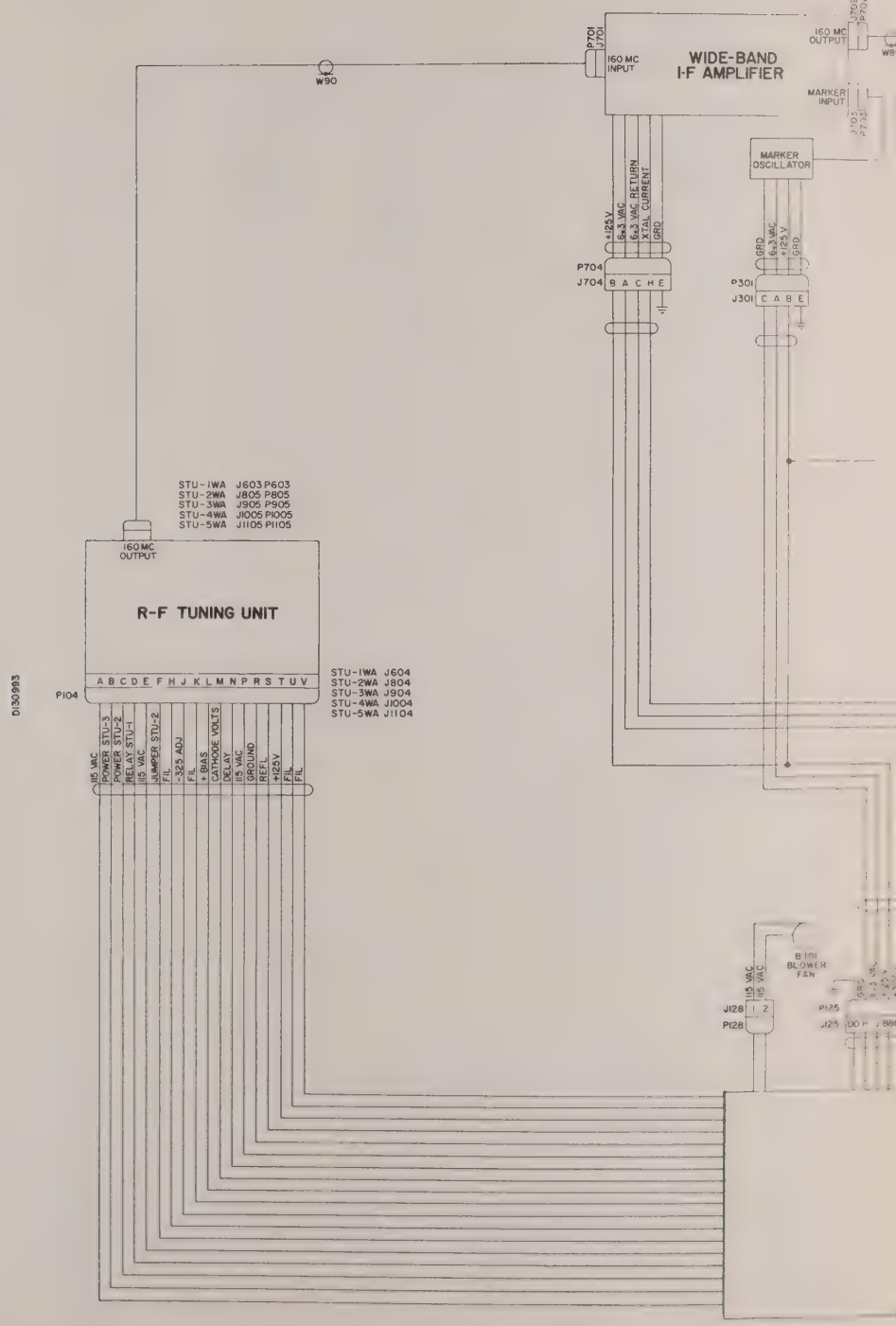



R648
330 2W
C616
0.1UF
C617
0.1UF
T603
9
8
4
5
7
3
2
1
H.V. SUPPLY OSCILLATOR
V616
6AR6
3
5
7
1
6
8
C621
1000
C619
1000
R653
1000
R652
100K
R651
100
2W
R664
150K
R665
3.9MEG
1W
C627
0.1UF
3KV
R669
3.9MEG
1W
R671
3.9MEG
1W

Figure




CRT Power Supply, Schematic Diagram


WIDE-BAND
I-F AMPLIFIER
160 MC
INPUT
160 MC
OUTPUT
MARKER
INPUT
MARKER
OSCILLATOR
W90
P701
J701
J702
P702
J703
P703
+125 V
6.3 VAC
6.3 VAC RETURN
X-TAL CURRENT
GRD
P704
J704
B A C H E
P301
J301
C A B E
STU-1WA J603 P603
STU-2WA J805 P805
STU-3WA J905 P905
STU-4WA J1005 P1005
STU-5WA J1105 P1105
160 MC
OUTPUT
R-F TUNING UNIT
A B C D E F H J K L M N P R S T U V
P104
STU-1WA J604
STU-2WA J804
STU-3WA J904
STU-4WA J1004
STU-5WA J1104
D130993
115 VAC
POWER STU-3
POWER STU-2
RELAY STU-1
115 VAC
JUMPER STU-2
FIL
-325 ADJ
FIL
+ BIAS
CATHODE VOLTS
DELAY
115 VAC
GROUND
REF L
+125 V
FIL
FIL
B 101
BLOWER
FAN
115 VAC
115 VAC
J128
P128
1 2

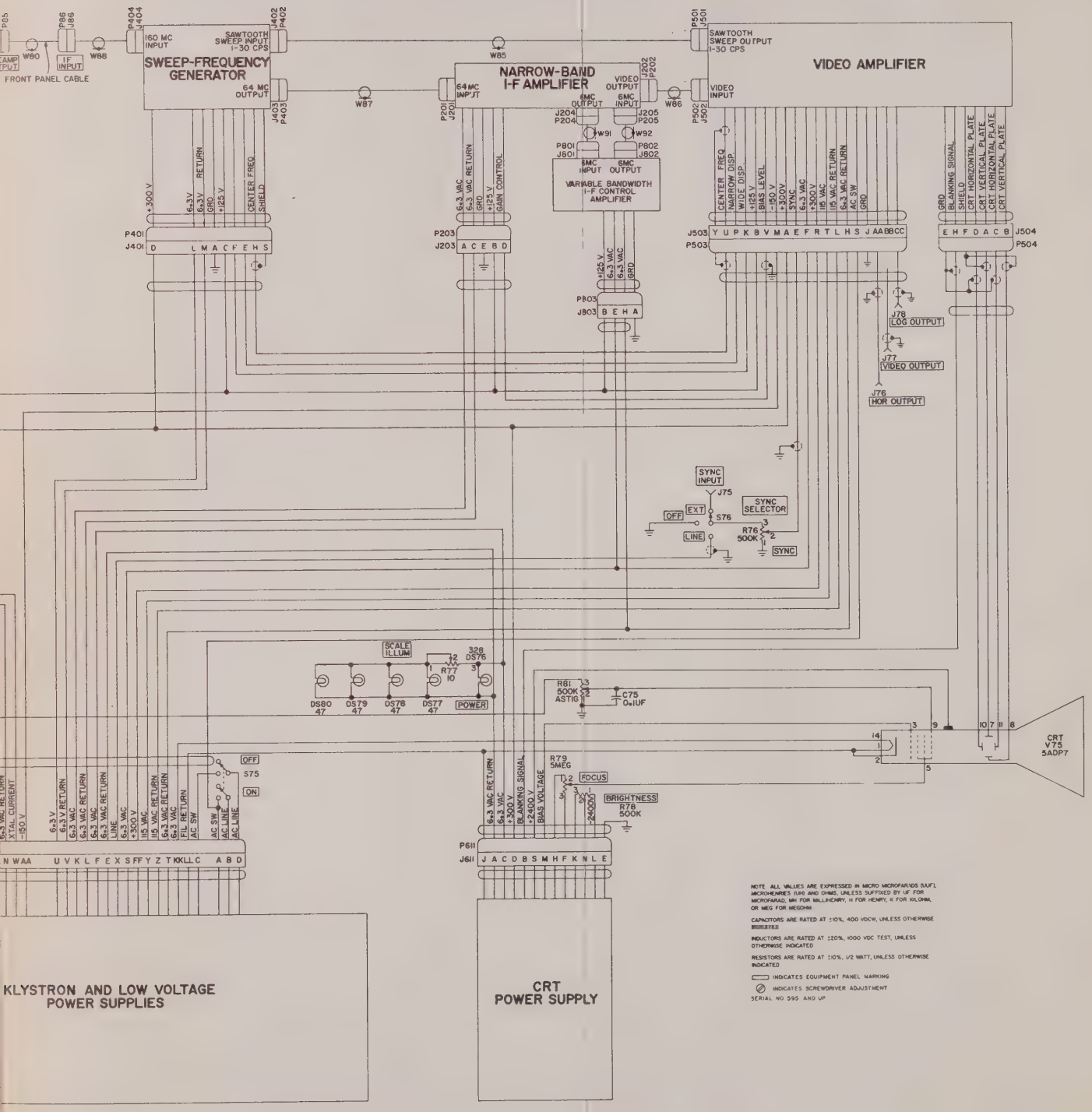



Figure 5-5. Interchassis Cabling Diagram

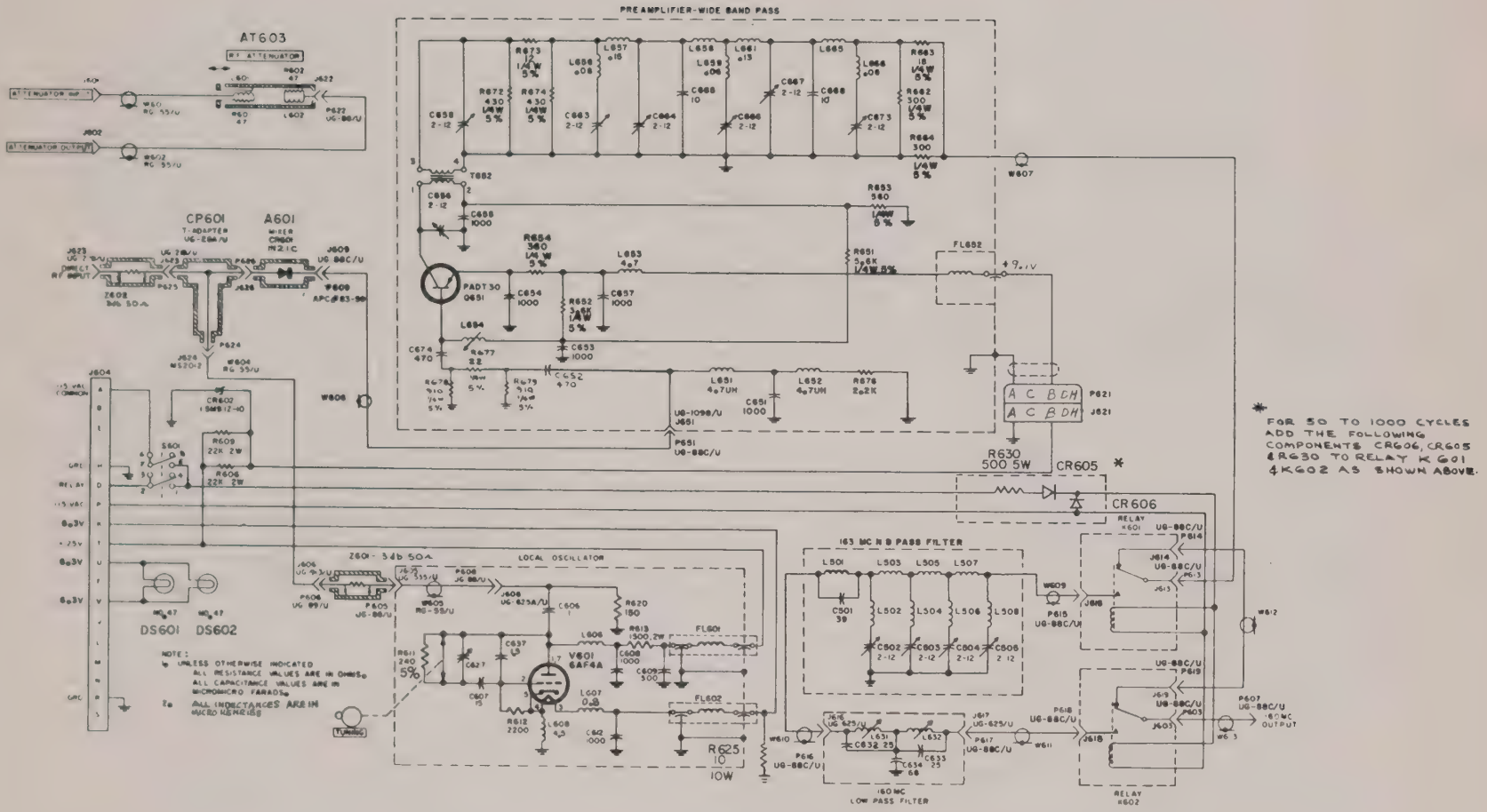



Figure 5-6. Tuning Unit STU-1WA, Schematic Diagram

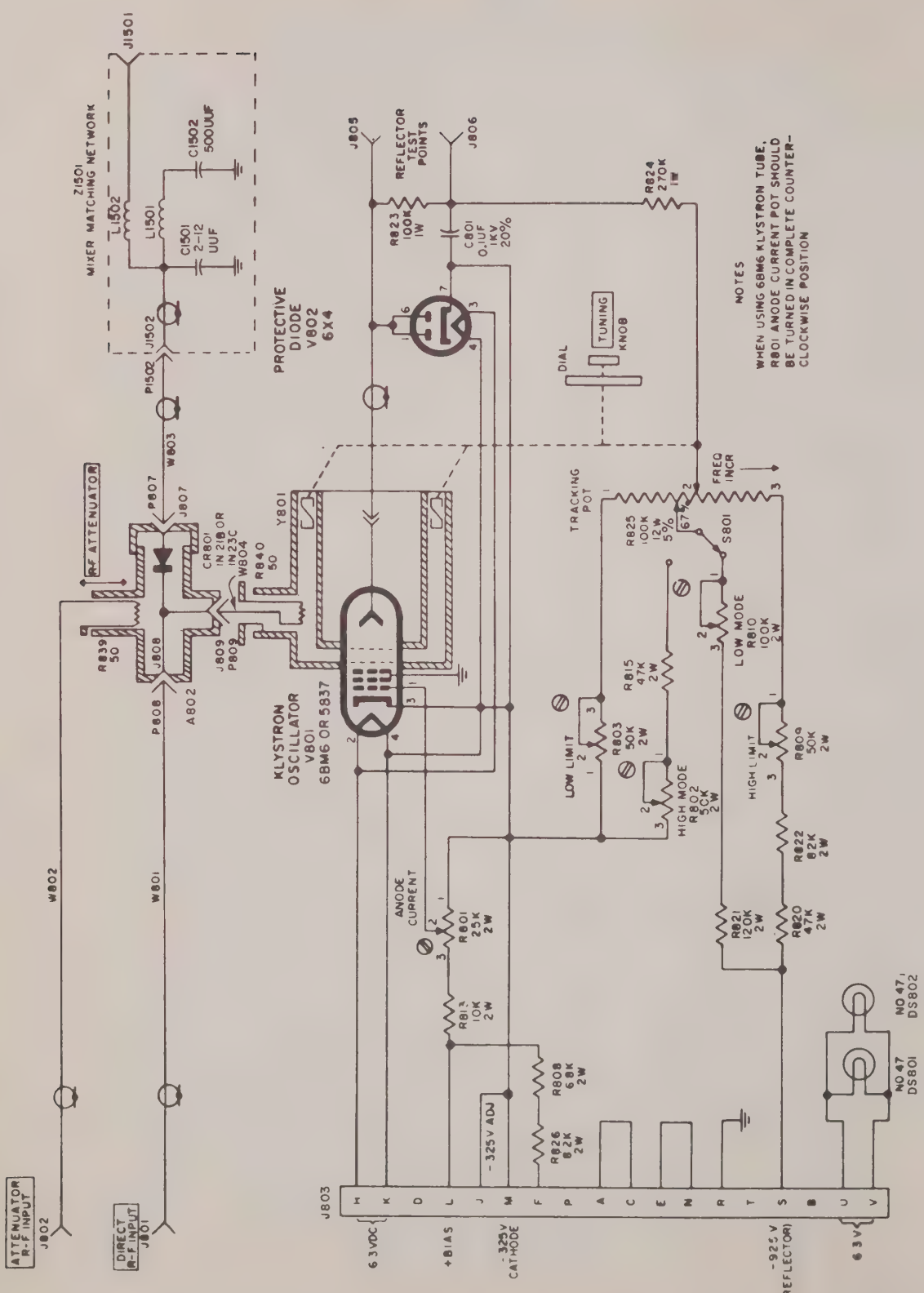



Figure 5-7. Tuning Unit Model STU-2WA, Schematic Diagram

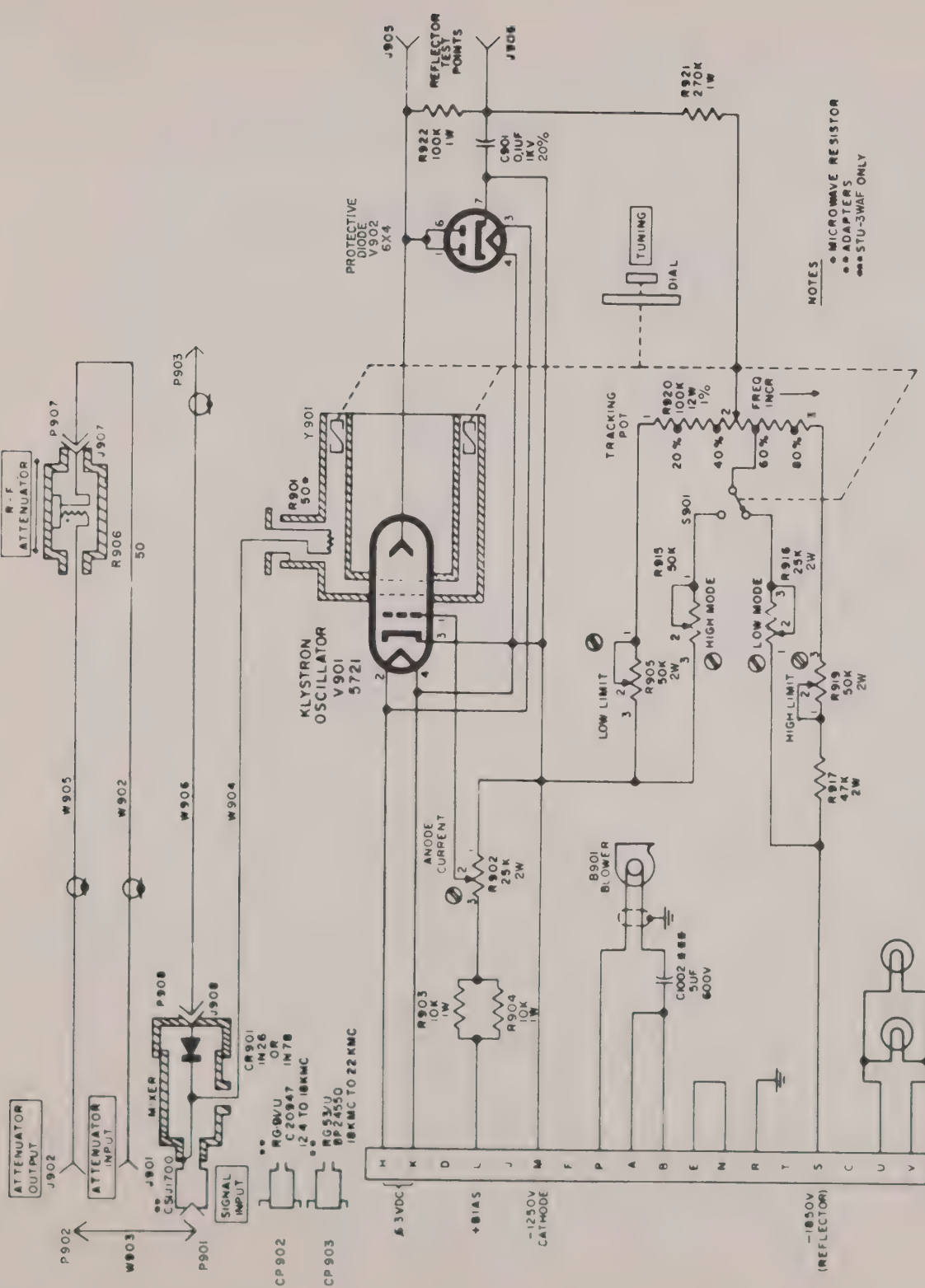



Figure 5-8. Tuning Unit Model STU-3WA, Schematic Diagram

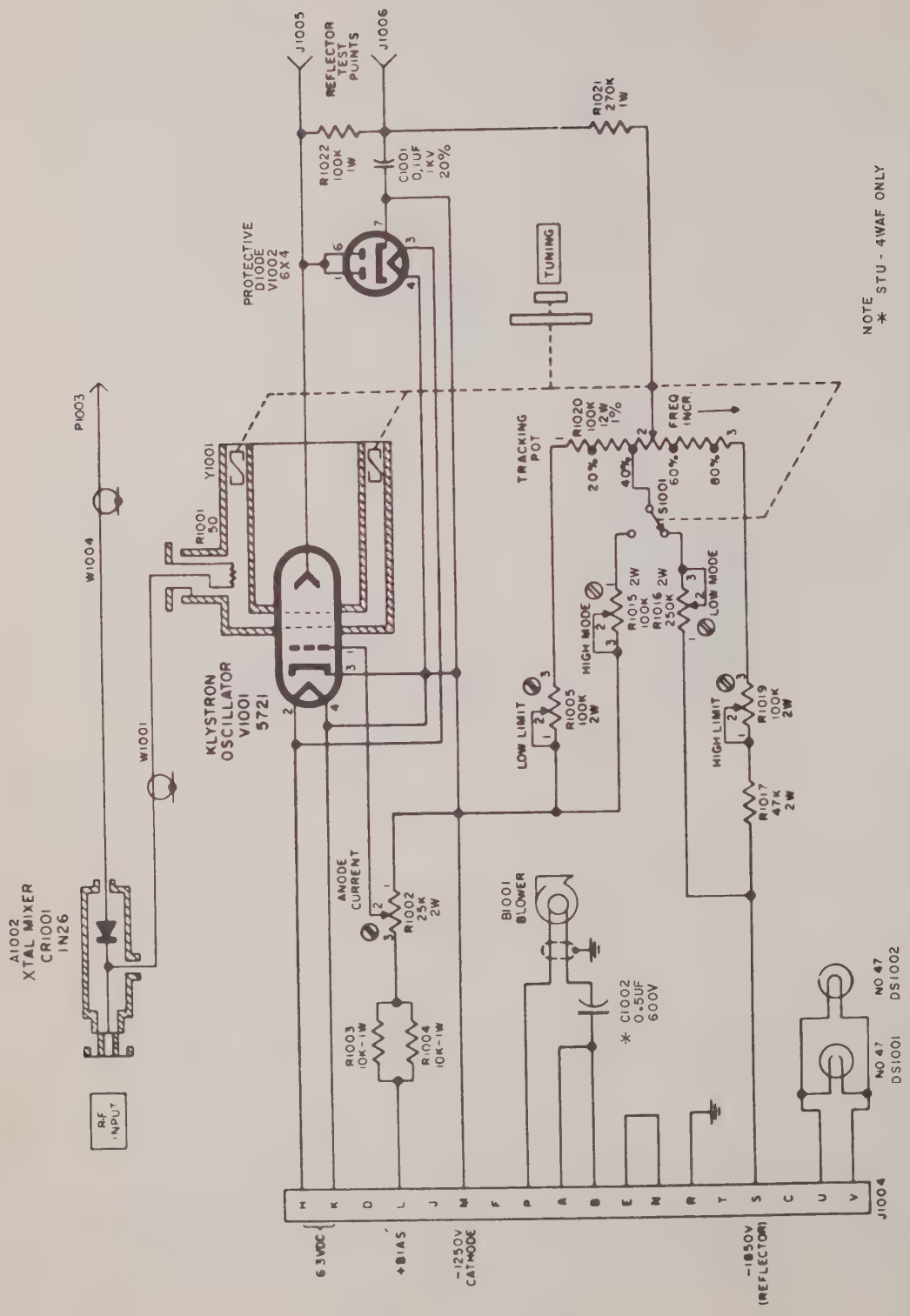



Figure 5-9. Tuning Unit Model STU-4WA, Schematic Diagram

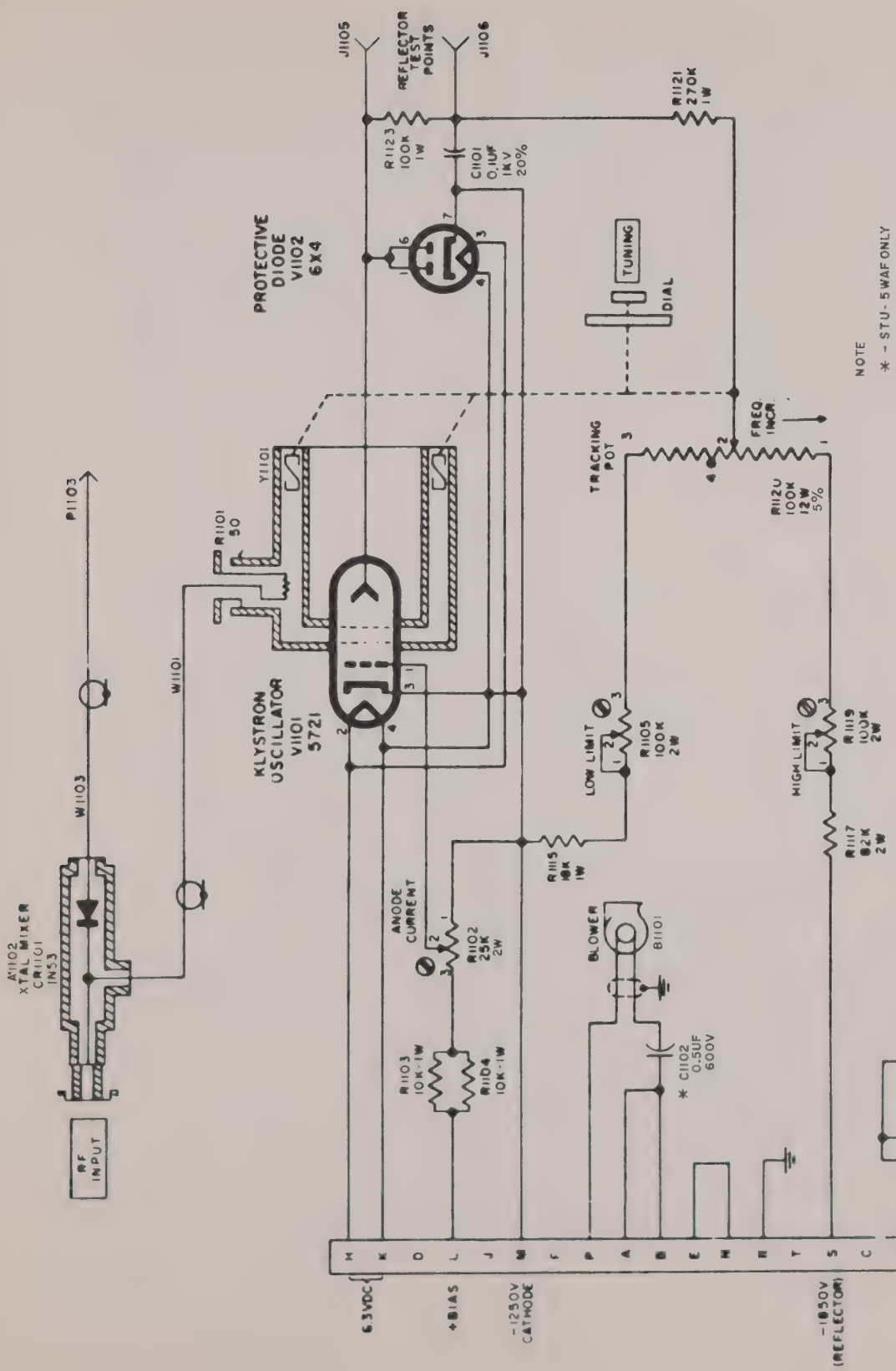



Figure 5-10. Tuning Unit Model STU-5WA, Schematic Diagram

TABLE 5-1. WIDE-BAND I-F AMPLIFIER VOLTAGE AND RESISTANCE MEASUREMENTS

| Socket | Tube Type | Pin Numbers 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| XV701 | 6922 | 95<br>17K | 0<br>0 | 1.8<br>68 | Fil<br>0 | 0<br>0 | 95<br>17K | 0<br>0 | 1.8<br>68 | 0<br>0 | Volts<br>Ohms |
| XV702 | 6922 | 115<br>15K | 0<br>0 | 2.0<br>100 | 0<br>0 | Fil<br>0 | 115<br>75K | 0<br>0 | 2.0<br>100 | 0<br>0 | Volts<br>Ohms |
| XV703 | 6922 | 115<br>15K | 0<br>0 | 2.0<br>100 | 0<br>0 | Fil<br>0 | 115<br>15K | 0<br>0 | 2.0<br>100 | 0<br>0 | Volts<br>Ohms |
| XV704 | 6922 | 95<br>16K | 0<br>0 | 1.8<br>100 | 0<br>0 | Fil<br>0 | 95<br>15K | 0<br>0 | 1.8<br>100 | 0<br>0 | Volts<br>Ohms |

TABLE 5-2. SWEEP FREQUENCY GENERATOR VOLTAGE AND RESISTANCE MEASUREMENTS

| Socket | Tube Type | Pin Numbers 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| XV403 | 6AQ5/<br>6005 | -19<br>100K | 2.5<br>100 | Fil<br>0 | 0<br>0 | 250<br>24K | 270<br>28K | -19<br>100K | | | Volts<br>Ohms |
| XV405<br>Note 4 | 5718 | -1.1<br>27K | | Fil<br>0 | | 0<br>0 | 0<br>0 | | 150<br>33K | | Volts<br>Ohms |
| XV406<br>Note 4 | 5718 | -1.1<br>27K | | Fil<br>0 | | 0<br>0 | 0<br>0 | | 150<br>33K | | Volts<br>Ohms |
| XV408 | 6AK5 | 0<br>0 | 1.4<br>100 | Fil<br>0 | 0<br>0 | 104<br>16K | 104<br>16K | 1.4<br>100 | | | Volts<br>Ohms |
| XV409<br>Note 5 | 5718 | -3<br>27K | | 0<br>0 | | 0<br>0 | Fil<br>0 | | 150<br>35K | | Volts<br>Ohms |

Note:
1. FIL. = 6.3 V AC between pins so marked.
2. Voltage readings taken with a 20,000 ohm-per-volt VOM between pin and ground.
3. Resistance readings taken with power cable removed.
4. Dispersion switch HIGH.
5. Dispersion switch LOW.

TABLE 5-3. NARROW-BAND I-F AMPLIFIER VOLTAGE AND RESISTANCE MEASUREMENTS

| Socket | Tube Type | Pin Numbers | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| XV201 | 6AK5 | 0<br>0 | 3.5<br>1.5K | Fil<br>0 | 0<br>0 | 125<br>15K | 120<br>20K | 3.5<br>1.5K | | | Volts<br>Ohms |
| XV202 | 6BE6 | 2.6<br>22K | 1.3<br>150 | Fil<br>0 | 0<br>0 | 125<br>15K | 106<br>17K | 0<br>100K | | | Volts<br>Ohms |
| XV203 | 6BE6 | -1.8<br>22K | 1.6<br>150 | Fil<br>0 | 0<br>0 | 98<br>18K | 98<br>18K | 0<br>10K | | | Volts<br>Ohms |
| XV204 | 6AH6 | 0<br>3.3K | 3.5<br>1.5K | Fil<br>0 | 0<br>0 | 120<br>16K | 120<br>16K | 3.5<br>1.5K | | | Volts<br>Ohms |
| XV205 | 6AH6 | 0<br>3.3K | 1.5<br>220 | Fil<br>0 | 0<br>0 | 115<br>16K | 115<br>16K | 1.5<br>220 | | | Volts<br>Ohms |

TABLE 5-4. VIDEO AMPLIFIER VOLTAGE AND RESISTANCE MEASUREMENTS

| Socket | Tube Type | Pin Numbers | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| XV501 | 6AS6 | -6.5<br>5M | 0<br>0 | Fil<br>0 | 0<br>0 | 42<br>500K | 120<br>30K | -1.0<br>120K | | | Volts<br>Ohms |
| XV502 | 12AT7 | 300<br>23K | 42<br>500K | 65<br>120K | 0<br>0 | 0<br>0 | | | | Fil<br>0 | Volts<br>Ohms |
| XV503 | 12AU7 | 115<br>65K | 9<br>22K | 28<br>10K | 0<br>0 | 0<br>0 | 65<br>37K | 25<br>700K | 28<br>10K | Fil<br>0 | Volts<br>Ohms |
| XV504 | 12AU7 | 240<br>45K | 5<br>400K | 21<br>12K | 0<br>0 | 0<br>0 | 235<br>40K | 0<br>10K | 11<br>4.7K | Fil<br>0 | Volts<br>Ohms |
| XV505 | 12AU7 | 165<br>115K | 0<br>320K | 8<br>75K | 0<br>0 | 0<br>0 | 185<br>115K | -1.6<br>350K | 8<br>75K | Fil<br>0 | Volts<br>Ohms |
| XV506 | 6AN8 | | | | Fil<br>0 | 0<br>0 | 75<br>48K | 37<br>12K | 0<br>30K | 0.7<br>2K | Volts<br>Ohms |
| XV507 | 6AN8 | 300<br>23K | -21<br>500K | -4<br>10K | Fil<br>0 | 0<br>0 | 87<br>76K | 125<br>15K | -3<br>85K | 0<br>0 | Volts<br>Ohms |
| XV508 | 6AH6 | 0<br>30K | 2.9<br>33K | Fil<br>0 | 0<br>0 | 193<br>63K | 125<br>15K | 2.9<br>33K | | | Volts<br>Ohms |
| XV509 | 6AH6 | 0.2<br>370K | 2.9<br>33K | Fil<br>0 | 0<br>0 | 115<br>63K | 125<br>15K | 2.9<br>33K | | | Volts<br>Ohms |

Note: 1. FIL. = 6.3 V AC between pins so marked.
2. Voltage readings taken with a 20,000 ohm-per-volt VOM between pin and ground.
3. Resistance readings taken with power cable removed.

TABLE 5-5. VARIABLE BANDWIDTH I-F CONTROL AMPLIFIER VOLTAGE AND RESISTANCE MEASUREMENTS

| Socket | Tube Type | Pin Numbers 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| XV801 | 12AT7 | 125<br>15K | 0<br>100K | .6<br>100 | Fil<br>0 | Fil<br>0 | 125<br>15K | 0<br>3.5 | .6<br>100 | 0<br>0 | Volts<br>Ohms |
| XV802 | 6AG5 | 0<br>3.5 | 1.8<br>270 | 0<br>0 | Fil<br>0 | 125<br>15K | 125<br>15K | 1.8<br>270 | | | Volts<br>Ohms |

TABLE 5-6. MARKER OSCILLATOR CHASSIS VOLTAGE AND RESISTANCE MEASUREMENTS

| Socket | Tube Type | Pin Numbers 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| XV301 | 5718 | -1.5<br>10K | | Fil<br>0 | | 0<br>0 | 0<br>0 | | 90<br>18K | | Volts<br>Ohms |

TABLE 5-7. POWER SUPPLY CHASSIS VOLTAGE AND RESISTANCE MEASUREMENTS

| Socket | Tube Type | Pin Numbers 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| XV101<br>Note 4 | 5R4 | | 680<br>∞ | | -580<br>∞ | | -580<br>∞ | | 680<br>∞ | | Volts<br>Ohms |
| XV102<br>Note 4 | 5R4 | | -580<br>∞ | | -1850<br>175K | | -1850<br>175K | | -580<br>∞ | | Volts<br>Ohms |
| XV103<br>Note 4 | 807 | Fil<br>0 | 125<br>∞ | -7.4<br>220K | 3.2<br>100 | Fil<br>0 | | | | | Volts<br>Ohms |
| XV104<br>Note 4 | 807 | Fil<br>0 | 125<br>∞ | -7.4<br>220K | 3.2<br>100 | Fil<br>0 | | | | | Volts<br>Ohms |
| XV105<br>Note 4 | 12AX7 | -7.4<br>220K | -74<br>220K | -73<br>33K | Fil<br>0 | Fil<br>0 | -74<br>220K | -152<br>500K | -150<br>66K | Fil<br>0 | Volts<br>Ohms |
| XV106<br>Note 4 | 0A2 | 0<br>0 | | | | | | -150<br>66K | | | Volts<br>Ohms |
| XV107<br>Note 4 | 0A2 | -1250<br>125K | | | | | | -1400<br>∞ | | | Volts<br>Ohms |
| XV108<br>Note 4 | 0A2 | -1400<br>∞ | | | | | | -1550<br>∞ | | | Volts<br>Ohms |

Note: 1. FIL. = 6.3 V AC between pins so marked.
2. Voltage readings taken with a 20,000 ohm-per-volt VOM between pin and ground.
3. Resistance readings taken with power cable removed.
4. STU-3WA, 4WA, 5WA operation.

(Cont'd)

TABLE 5-7. POWER SUPPLY CHASSIS VOLTAGE AND RESISTANCE MEASUREMENTS (Cont'd)

| Socket | Tube Type | Pin Numbers | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| XV109 Note 4 | 0A2 | -1550<br>0 | | | | | | -1700<br>∞ | | | Volts<br>Ohms |
| XV110 Note 4 | 0A2 | -1700<br>∞ | | | | | | -1850<br>175K | | | Volts<br>Ohms |
| XV111 | 6080 | 210<br>480K | 470<br>1M | 300<br>23K | 60<br>500K | 260<br>470K | 125<br>15K | Fil<br>0 | Fil<br>0 | | Volts<br>Ohms |
| XV112 | 6AR6 | | Fil<br>0 | 80<br>1M | 125<br>15K | -5<br>500K | | Fil<br>0 | 0<br>0 | | Volts<br>Ohms |
| XV113 | 6080 | 210<br>480K | 470<br>1M | 300<br>23K | 210<br>480 | 470<br>1M | 300<br>23K | Fil<br>0 | Fil<br>0 | | Volts<br>Ohms |
| XV114 | 6080 | 60<br>500K | 260<br>470K | 125<br>15K | 60<br>500K | 260<br>470K | 125<br>15K | Fil<br>0 | Fil<br>0 | | Volts<br>Ohms |
| XV115 | 12AX7 | -5.2<br>500K | -87<br>45K | -85<br>72K | Fil<br>0 | Fil<br>0 | 0<br>0 | -85<br>87K | -85<br>72K | Fil<br>0 | Volts<br>Ohms |
| XV116 | 12AX7 | 210<br>450K | 160<br>500K | 160<br>28K | Fil<br>0 | Fil<br>0 | 160<br>500K | 0<br>0 | 0<br>80K | Fil<br>0 | Volts<br>Ohms |
| XV117 | 12AX7 | 60<br>500K | -.8<br>470K | 0<br>0 | Fil<br>0 | Fil<br>0 | -.8<br>470K | -50<br>60K | -50<br>42K | Fil<br>0 | Volts<br>Ohms |
| XV118 | 5651 | | -87<br>45K | | | 0<br>0 | | | | | Volts<br>Ohms |
| XV101 Note 5 | 5R4 | | 415<br>∞ | | -235<br>∞ | | -235<br>∞ | | 415<br>∞ | | Volts<br>Ohms |
| XV102 Note 5 | 5R4 | | -220<br>∞ | | -925<br>100K | | -925<br>100K | | -220<br>∞ | | Volts<br>Ohms |
| XV103 Note 5 | 807 | Fil<br>0 | 125<br>∞ | -7<br>220K | 3<br>100 | Fil<br>0 | | | | | Volts<br>Ohms |
| XV104 Note 5 | 807 | Fil<br>0 | 125<br>∞ | -7<br>220K | 3<br>100 | Fil<br>0 | | | | | Volts<br>Ohms |
| XV105 Note 5 | 12AX7 | -7<br>220K | -73<br>220K | -71<br>33K | Fil<br>0 | Fil<br>0 | -73<br>220K | -152<br>500K | -150<br>66K | Fil<br>0 | Volts<br>Ohms |
| XV106 Note 5 | 0A2 | 0<br>0 | | | | | | -150<br>66K | | | Volts<br>Ohms |
| XV107 Note 5 | 0A2 | 325<br>50K | | | | | | 475<br>∞ | | | Volts<br>Ohms |

Note: 1. FIL. = 6.3 V AC between pins so marked.
2. Voltage readings taken with a 20,000 ohm-per-volt VOM between pin and ground.
3. Resistance readings taken with power cable removed.
4. STU-3WA, 4WA, 5WA operation.
5. STU-2WA operations.

(Cont'd)

TABLE 5-7. POWER SUPPLY CHASSIS VOLTAGE AND RESISTANCE MEASUREMENTS (Cont'd)

| Socket | Tube Type | Pin Numbers 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| XV108 Note 4 | 0A2 | 475<br>∞ | | | | | | 625<br>∞ | | | Volts<br>Ohms |
| XV109 Note 4 | 0A2 | 625<br>∞ | | | | | | 775<br>∞ | | | Volts<br>Ohms |
| XV110 Note 4 | 0A2 | 775<br>∞ | | | | | | 925<br>100K | | | Volts<br>Ohms |

TABLE 5-8. R-F TUNING UNITS STU-1WA, STU-2WA, STU-3WA, STU-4WA, STU-5WA VOLTAGE AND RESISTANCE MEASUREMENTS

| Socket | Tube Type | Pin Numbers 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| XV601 | 6AF4A | 102<br>16.5K | -1.5<br>2.2K | Fil<br>0 | Fil<br>0 | 0<br>0 | | 102<br>16.5K | | | Volts<br>Ohms |
| XV801 | 6BM6 | -325<br>50K | Fil<br>50K | -325<br>50K | Fil<br>50K | | | | | | Volts<br>Ohms |
| XV802 | 6X4 | Note<br>5 | | Fil<br>50K | Fil<br>50K | | Note<br>5 | -325<br>50K | | | Volts<br>Ohms |
| XV901<br>XV1001<br>XV1101 | 5721 | -1245<br><br>135K | Fil<br><br>125K | -1250<br><br>125K | Fil<br><br>125K | | | | | | Volts<br><br>Ohms |
| XV902<br>XV1002<br>XV1102 | 6X4 | Note<br>5 | | Fil<br><br>125K | Fil<br><br>125K | | Note<br>5 | -1250<br><br>125K | | | Volts<br><br>Ohms |

Note:
1. FIL. = 6.3 V AC between pins so marked.
2. Voltage readings taken with a 20,000 ohm-per-volt VOM between pin and ground.
3. Resistance readings taken with power cable removed.
4. STU-2WA operations.
5. Readings depend upon setting of tuning control.

# SECTION VI

# PARTS LIST

## 6-1. INTRODUCTION.

6-2. This parts list provides an alpha-numerical listing, in reference symbol sequence of the replaceable electrical, certain electro-mechanical, and mechanical parts of the equipment.

6-3. ORDERING INFORMATION. Orders for parts should contain the following information:

a. Equipment name and model.
b. Serial number.
c. Reference symbol of part.
d. Manufacturer's part number and code.

## 6-4. HOW TO USE THE PARTS LIST.

6-5. An explanation of the structure of the parts list, Table 6-2, and the meaning of the entries in the five columns are given in the following paragraphs. (See Figure 6-1.)

1 2 3 4 5 6 7

TABLE 6-1. PARTS LIST

SECTION VI
PARTS LIST

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| B1 AND B2 | BATTERY,DRY,1.5VDC | VS036 | CQ | 2 |
| C1 | CAPACITOR,MICA,220UUF,5 PCT,300WVDC | CM15C221J | AU | 1 |
| C2 | CAPACITOR,PAPER,1UF,20 PCT,400WVDC | 620M | AC | 1 |
| C3 | NOT USED | | | |
| C4 | CAPACITOR,PAPER,0.033UF,10 PCT,600WVDC | 6TM-S33 | BN | 1 |
| C5 | SAME AS C1 | | | |
| C6 THRU C9 | CAPACITOR,MICA,51UUF,5 PCT,500WVDC | CM20C510J | AU | 1 |
| F1 AND F2 | FUSE,CARTRIDGE,DELAY,5AMP,3AG | 313005 | AP | 2 |
| H1 | KNOB,RANGE SELECTOR | 70-5-2G | BH | 1 |

Figure 6-1. Parts List Example

6-6. REFERENCE SYMBOL COLUMN. The reference symbol column (1, Figure 6-1) contains the reference symbol assigned to each part, which also identifies the part on the schematic diagram or in an illustration. The listing is in alpha-numerical order.

6-7. DESCRIPTION COLUMN. The description column (2) contains the description for each part. When the same part is used more than once in the equipment, the second and subsequent listings for that part use the phrase "SAME AS ___" (4) in the description column and the remaining columns (5, 6, and 7) are left blank. When a reference symbol designation has not been used or its assignment has been cancelled, the description column contains the phrase "NOT USED" (3).

6-8. MANUFACTURER'S PART NUMBER COLUMN. The manufacturer's part number column (5) contains the part number assigned by the manufacturer of the part, except for "SAME AS ___" and "NOT USED" listings.

6-9. MANUFACTURER'S CODE COLUMN. The manufacturer's code column (6) contains a letter code identifying the manufacturer of the part. Table 6-1 contains a listing of the letter codes and the manufacturers names and addresses.

6-10. MAINTENANCE QUANTITY COLUMN. The maintenance quantity column (7) contains the recommended maintenance quantity for each part, based on a one year requirement for an equipment in operation for 10 hours a day throughout the year. The recommended maintenance quantities will provide a high degree of equipment reliability in areas where an adequate supply of replacement parts is not available. The recommended maintenance quantity is listed for the initial occurrence of the part in the parts list, but covers all subsequent listings.

6-11. To determine recommended maintenance quantity for periods other than one year, multiply the one-year quantity by the desired period, expressed in years.

6-12. To determine recommended maintenance quantity for operating periods other than 10 hours per day, use the equation given below.

$$MQ' = MQ \times \frac{HR_{op}}{10}$$

where: MQ = Maintenance quantity from Table 6-1

MQ' = Maintenance quantity for desired operating period

$HR_{op}$ = Operating period in hours

Round off the quantity obtained to the nearest whole number.

TABLE 6-1. MANUFACTURER'S CODE

| CODE | NAME AND ADDRESS |
|---|---|
| A | Aeronautical Standards Group, Dept. of Navy & Air Force, Washington, D.C. |
| B | Aerovox Corp., New Bedford, Mass. |
| C | Alden Products Co., Brockton, Mass. |
| D | Allen-Bradley Co., Milwaukee, Wis. |
| E | Amperite Co., New York, N.Y. |
| F | Amphenol Connector Division of Amphenol-Borg Electronics Corp., Chicago, Ill. |
| G | Belden Mfg. Co., Chicago, Ill. |
| H | Bendix Semiconductor Division of Bendix Corp., Holmdel, N.J. |
| J | Birnbach Radio Co., New York, N.Y. |
| K | Birtcher Corp., Los Angeles, Calif. |
| L | Boston Gear Works Division of Murray Co. of Texas, Boston, Mass. |
| M | Shallcross Mfg. Co., Selma, N.C. |
| N | Bourns Laboratories, Inc., Riverside, Calif. |
| P | Centralab Division of Globe-Union, Inc., Milwaukee, Wis. |
| Q | Chatam Electronics Division of Tung-Sol Electric, Inc., Livingston, N.J. |
| R | Cinch Mfg. Co., Division of United-Carr Fastener Corp., Chicago, Ill. |
| S | Clarostat Mfg. Co., Inc., Dover, N.H. |
| T | Condenser Products Co., Brooksville, Fla. |
| U | Cornell-Dubilier Electric Corp., Newark, N.J. |
| V | Dialight Corp., Brooklyn, N.Y. |
| W | Eby, S.E., Co., Philadelphia, Pa. |
| X | Elco Corp., Philadelphia, Pa. |
| Y | Erie Resistor Corp., Erie, Pa. |
| Z | General Electric Co., Miniature Lamp Department of Lamp Division of Consumer Products Group, Cleveland, Ohio |
| AA | General Electric Co., Semi-Conductor Products Department of Electronic Components Division of Electronic, Atomic and Defense Systems Group, Syracuse, N.Y. |
| AB | General Transistor Western Corp., Los Angeles, Calif. |
| AC | Good-All Electric Mfg. Co., Ogallala, Nebr. |
| AD | Hammarlund Co., Inc., New York, N.Y. |
| AE | Harvey Hubbell, Inc., Bridgeport, Conn. |
| AF | Helipot Division of Beckman Instruments,Inc., Fullerton, Calif. |
| AG | Hopkins Engineering Co., San Fernando, Calif. |
| AH | Hughes Products Division of Hughes Aircraft Co., Newport Beach, Calif. |
| AJ | International Resistance Co., Philadelphia, Pa. |
| AK | Jan Hardware Mfg. Co., Inc., Long Island City, N.Y. |
| AL | JBT Instruments Inc., New Haven, Conn. |
| AM | Kenyon Transformer Co., Inc., Jersey City, N.J. |
| AN | Kurman Electric Co., Inc., Brooklyn, N.Y. |
| AP | Littelfuse, Inc., Des Plaines, Ill. |
| AQ | Mallory Battery Co., North Tarrytown, N.Y. |
| AR | Mendelsohn Speed Gun Co., Haskell, N.J. |
| AS | James Millen Mfg. Co., Inc., Malden, Mass. |
| AT | J.W. Miller Co., Los Angeles, Calif. |
| AU | Military Specifications |
| AV | Military Standards |
| AW | Minor Rubber Co., Inc., Bloomfield, N.J. |
| AX | Micro Switch Div., Minneapolis-Honeywell Regulator Co., Freeport, Ill. |
| AY | New Departure Division of General Motors Corp., Bristol, Conn. |
| AZ | Ohmite Mfg. Co., Skokie, Ill. |
| BA | Patton MacGuyer Co., Providence, R.I. |
| BB | Parker Kalon Division of General American Transportation Corp., Clifton, N.J. |
| BC | Pic Design Corp., East Rockaway, N.Y. |

TABLE 6-1. MANUFACTURER'S CODE (CONT'D)

| CODE | NAME AND ADDRESS |
|---|---|
| BD | Plastic Capacitors, Inc., Chicago, Ill. |
| BE | Polarad Electronics Corp., Long Island City, N.Y. |
| BF | Potter and Brumfield Division of American Machine and Foundry Co., Princeton, Ind. |
| BG | Pyramid Electric Co., Darlington, S.C. |
| BH | Raytheon Co., Industrial Components Division, Industrial Tube Operation, Newton, Mass. |
| BJ | RCA Semiconductor and Materials Division of Radio Corp. of America, Somerville, N.J. |
| BK | Ripley Co., Inc., Middletown, Conn. |
| BL | Sangamo Electric Co., Springfield, Ill. |
| BM | Shakeproof Division of Illinois Tool Works, Elgin, Ill. |
| BN | Sprague Electric Co., North Adams, Mass. |
| BP | Staver Co., Inc., Bay Shore, Long Island, N.Y. |
| BQ | Sterling Transformer Corp., Brooklyn, N.Y. |
| BR | Technitrol Engineering Co., Philadelphia, Pa. |
| BS | Telewave Laboratories, Inc., Long Island City, N.Y. |
| BT | Times Facsimile Corp., New York, N.Y. |
| BU | Transitron Electronic Corp., Wakefield, Mass. |
| BV | Ucinite Co., Newtonville, Mass. |
| BW | United Transformer Co., New York, N.Y. |
| BX | Utah Radio Products Corp., Huntington, Ind. |
| BY | Vector Mfg. Co., Houston, Tex. |
| BZ | Victory Engineering Corp., Springfield, N.J. |
| CA | Waldes Kohinoor, Inc., Long Island City, N.Y. |
| CB | Weckesser Co., Chicago, Ill. |
| CC | Winchester Electronics Co., Inc., Norwalk, Conn. |
| CD | Cutler-Hammer, Inc., Milwaukee, Wis. |
| CE | Olsen Machine and Tool Co., North Abington, Mass. |
| CF | Cannon Electric Co., Los Angeles, Calif. |
| CG | Arco Electronics, Inc., Great Neck, N.Y. |
| CH | Cambridge Thermionic Corp., Cambridge, Mass. |
| CJ | Sylvania Electric Products, Inc., Semiconductor Division, Woburn, Mass. |
| CK | Commercially Available Component |
| CL | Stackpole Carbon Co., St. Marys, Pa. |
| CM | Astron Co., East Newark, N.J. |
| CN | Sarkes Tarzian, Inc., Bloomington, Ind. |
| CP | Arrow Hart and Hegeman Electric Co., Hartford, Conn. |
| CQ | Radio Corp. of America, New York, N.Y. |
| CR | Allied Control Co., Inc., New York, N.Y. |
| CS | Sylvania Electric Products, Inc., New York, N.Y. |
| CT | Leach Corp., Leach Relay Co. Division, Los Angeles, Calif. |
| CU | Triplett Electrical Instrument Co., Bluffton, Ohio |
| CV | Bliley Electric Co., Inc., Erie, Pa. |
| CW | Switchcraft, Inc., Chicago, Ill. |
| CX | Industrial Products Co., Division of Amphenol-Borg Electronics Corp., Danbury, Conn. |
| CY | Mepco Division of Sessions Clock Co., Morristown, N.J. |
| CZ | Resistance Products Co., Harrisburg, Pa. |
| DA | Continental-Wirt Electronics Corp., Philadelphia, Pa. |
| DB | Ward Leonard Electric Co., Mount Vernon, N.Y. |
| DC | Superex Electronics Corp., Yonkers, N.Y. |
| DD | Oak Mfg. Co., Crystal Lake, Ill. |
| DE | National Radio Co., Inc., Malden, Mass. |

TABLE 6-1. MANUFACTURER'S CODE (CONT'D)

| CODE | NAME AND ADDRESS |
|---|---|
| DF | Wright Electronics, Inc., Kansas City, Mo. |
| DG | Torrington Mfg. Co., Torrington, Conn. |
| DH | Union Electronics, Long Island City, N.Y. |
| DJ | Applied Research, Inc., Port Washington, N.Y. |
| DK | Ferroxcube Corp. of America, Saugerties, N.Y. |
| DL | Technology Instrument Corp., Acton, Mass. |
| DM | Allen B. DuMont Laboratories, Inc., New York, N.Y. |
| DN | Amperex Electronic Co., Division of North American Philips Co., Inc., Hicksville, N.Y. |
| DP | Industrial Condenser Corp., Chicago, Ill. |
| DQ | International Rectifier Corp., El Segundo, Calif. |
| DR | CTS Corp., Elkhart, Ind. |
| DS | General Radio Co., West Concord, Mass. |
| DT | Microlab, Inc., Livingston, N.J. |
| DU | Comar Electric Co., Chicago, Ill. |
| DV | Film Capacitors, Inc., New York, N.Y. |
| DW | FXR Division of Amphenol-Borg Electronics Corp., Danbury, Conn. |
| DX | Britton Electronics Corp., Mount Vernon, N.Y. |
| DY | Chicago Standard Transformer Corp., Chicago, Ill. |
| DZ | Mallory, P.R., and Co., Inc., Indianapolis, Ind. |
| EA | Automatic Metal Products Co., Brooklyn, N.Y. |
| EB | Dale Electronics, Inc., Columbus, Nebr. |
| EC | Gulton Industries, Inc., Metuchen, N.J. |
| ED | International Electronic Industries, Inc., Nashville, Tenn. |
| EE | Clairtron Mfg. Co., Orange, N.J. |
| EF | Technical Apparatus Builders, New York, N.Y. |
| EG | Bussmann Fuse Division of McGraw-Edison Co., St. Louis, Mo. |
| EH | The Superior Electric Co., Bristol, Conn. |
| EJ | Rotron Mfg. Co., Inc., Woodstock, N.Y. |
| EK | Jeffers Electronics Division of Speer Carbon Co., DuBois, Pa. |
| EL | JFD Electronics Corp., Brooklyn, N.Y. |
| EM | Essex Electronics Division of Nytronics Inc., Berkeley Heights, N.J. |
| EN | Torotel, Inc., Kansas City, Mo. |
| EP | Texas Instruments Inc., Dallas, Texas |
| EQ | Wells Electronics Co., South Bend, Ind. |
| ER | Thordarson-Meissner Division of Maguire Industries, Inc., Mount Carmel, Ill. |
| ES | Piezo Crystal Co., Carlisle, Pa. |
| ET | Pacific Semiconductors, Inc., Hawthorne, Calif. |
| EV | Fasco Industries, Inc., Rochester, N.Y. |
| EW | Triad Transformer Corp., Venice, Calif. |
| EX | National Tel Tronics Corp., Yonkers, N.Y. |
| EY | Carling Electric, Inc., Hartford, Conn. |
| EZ | E.F. Johnson Co., Waseca, Minn. |
| FA | Thomas Electronics, Inc., Passaic, N.J. |
| FB | Merit Coil and Transformer Corp., Hollywood, Fla. |
| FC | Aladdin Electronics Division of Aladdin Industries, Inc., Nashville, Tenn. |
| FE | Sperry Semiconductor Division of Sperry Rand Corp., Norwalk, Conn. |
| FF | Corning Glass Works, Electronic Components Department, Bradford, Pa. |
| FG | Duncan Electronics, Inc., Santa Ana, Calif. |
| FH | Advance Electronics Laboratories, Inc., Passaic, N.J. |
| FJ | Fastex Division of Illinois Tool Works, Des Plaines, Ill. |

TABLE 6-1. MANUFACTURER'S CODE (CONT'D)

| CODE | NAME AND ADDRESS |
|---|---|
| FK | Motorola, Inc., Semiconductor Products Division, Phoenix, Ariz. |
| FL | Electro Motive Mfg. Co., Willimantic, Conn. |
| FM | Varian Associates, Palo Alto, Calif. |
| FN | Quality Components, Inc., St. Marys, Pa. |
| FP | Automatic Mfg. Corp., Newark, N.J. |
| FQ | Electra Mfg. Co., Kansas City, Mo. |
| FR | Dage Electric Co., Inc., Beech Grove, Ind. |
| FS | The Cornish Wire Co., New York, N.Y. |
| FT | RLC Electronics, Inc., Mamaroneck, N.Y. |
| FU | Fairchild Camera and Instrument Corp., Semiconductor Division, Mountain View, Calif. |
| FV | Burnell and Co., Inc., Pelham Manor, N.Y. |
| FW | Dearborn Electronic Laboratories, Inc., Orlando, Fla. |
| FX | Weston Instruments, Division of Daystrom, Inc., Newark, N.J. |
| FY | HI-Q Division of Aerovox Corp., Myrtle Beach, S.C. |
| FZ | Electric Regulator Corp., South Norwalk, Conn. |
| GA | Simpson Electric Co., Chicago, Ill. |
| GB | Control Switch Division, Controls Co. of America, Chicago, Ill. |
| GC | Semicon, Inc., Bedford, Mass. |
| GD | Filtron Co., Inc., Flushing, Long Island, N.Y. |
| GE | Rotating Components, Inc., Brooklyn, N.Y. |
| GF | Transco Products, Inc., Los Angeles, Calif. |
| GG | Thompson Ramo Wooldridge, Inc., Cleveland, Ohio |
| GH | PRD Electronics, Inc., Brooklyn, N.Y. |
| GJ | Solitron Devices, Inc., Norwood, N.J. |
| GK | Valpey Crystal Co., Holliston, Mass. |
| GL | Sage Laboratories, Inc., Natick, Mass. |
| GM | J.H. Williams and Co., Buffalo, N.Y. |
| GN | Kings Electronics Co., Inc., Tuckahoe, N.Y. |
| GP | ITT Federal Division of International Telephone and Telegraph Corp., Clifton, N.J. |
| GQ | Herman H. Smith, Inc., Brooklyn, N.Y. |
| GR | Leecraft Mfg. Co., Inc., New York, N.Y. |

TABLE 6-2. PARTS LIST

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| AT301 | ATTENUATOR ASSY | B137218 | BE | 1 |
| A101 | POWER SUPPLY ASSY | D131633 | BE | 1 |
| A201 | NARROW BAND ASSY, USED ON SERIAL NOS. 595 THRU 634 | D127647 | BE | 1 |
| A201 | NARROW BAND ASSY, USED ON SERIAL NOS. 635 AND UP | D137221 | | 1 |
| A301 | MARKER OSCILLATOR ASSY | D135352 | BE | 1 |
| A401 | SWEEPER ASSY | D128004 | BE | 1 |
| A501 | VIDEO ASSY | D132282 | BE | 1 |
| A601 | CRT SUPPLY ASSY | D128757 | BE | 1 |
| A701 | WIDE BAND ASSY | D126910 | BE | 1 |
| A801 | CONTROL AMPLIFIER ASSY | D141460 | BE | 1 |
| B101 | FAN ASSY, AXIAL, 115VAC, 50-60CPS | C146653 | BE | 1 |
| B101A | MOTOR, FAN, SYNCHRONOUS, 115VAC, 50-60CPS, USED ON MODEL TSA-WF ONLY | B103377 | BE | 1 |
| B101A | MOTOR, FAN, SYNCHRONOUS, 115VAC, 50-60CPS PART OF B101 | BP22146 | BE | 1 |
| B101B | IMPELLER, CCW ROTATION, REAR MOUNTED HUB, PART OF B101/POLARAD PART NO. B706977 | 520-402 | DG | 1 |
| CR101 | SEMICONDUCTOR DEVICE, DIODE, ZENER | 1N2970A | CK | 1 |
| CR102 THRU CR109 | SEMICONDUCTOR DEVICE, DIODE, SILICON /POLARAD PART NO. B707117 | CER-71 | GJ | 16 |
| CR110 | SEMICONDUCTOR DEVICE, DIODE, GERMANIUM /POLARAD PART NO. A27794 | 4JA211AB1AC1 | AA | 1 |
| CR111 THRU CR114 | SAME AS CR102 | | | |
| CR115 | SEMICONDUCTOR DEVICE, RECTIFIER, SILICON | 1N1341 | CK | 1 |
| CR116 THRU CR120 | NOT USED | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| CR121 AND CR122 | SAME AS CR102 | | | |
| CR201 | SEMICONDUCTOR DEVICE,DIODE,GERMANIUM | 1N69 | CK | 2 |
| CR401 | NOT USED | | | |
| CR402 | SEMICONDUCTOR DEVICE,DIODE,GERMANIUM | 1N82A | CK | 1 |
| CR501 | SAME AS CR201 | | | |
| CR502 THRU CR508 | SEMICONDUCTOR DEVICE,DIODE,GERMANIUM | 1N198 | CK | 7 |
| CR509 AND CR510 | NOT USED | | | |
| CR511 AND CR512 | SAME AS CR121 | | | |
| C1 THRU C74 | NOT USED | | | |
| C75 | CAPACITOR,CERAMIC,0.1UF,PLUS 80 PCT, MINUS 20 PCT,500WVDC/POLARAD PART NO. B702290 | 41C92 | BN | 1 |
| C101 AND C102 | CAPACITOR,PLASTIC,4UF,10 PCT,2000WVDC /POLARAD PART NO. B506803 | 0E-20-405 | BD | 1 |
| C103 | CAPACITOR,PLASTIC,2UF,10 PCT,3000WVDC /POLARAD PART NO. B506806 | 0E-30-205 | BD | 1 |
| C104 | CAPACITOR,PLASTIC,0.5UF,10 PCT,2000WVDC | 0E-20-504 | BC | 1 |
| C105 THRU C107 | CAPACITOR,ELECTROLYTIC,DUAL SECT,40UF, PLUS 50 PCT,MINUS 10 PCT,450WVDC,EACH SECT | 17D-15 | BN | 1 |
| C108 | CAPACITOR,PAPER,2UF,10 PCT,600WVDC | CP53B1EF205K | AU | 1 |
| C109 | SAME AS C105 | | | |
| C110 | CAPACITOR,ELECTROLYTIC,2UF,450WVDC /POLARAD PART NO. C511351 | TVA-1701 | BN | 1 |
| C111 | SAME AS C108 | | | |
| C112 | SAME AS C110 | | | |
| C113 | CAPACITOR,PLASTIC,0.25UF,10 PCT,200WVDC /POLARAD PART NO. B508732 | 2TM-P25 | BN | 1 |

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| C114 | CAPACITOR,PAPER,0.05UF,20 PCT,1600WVDC /POLARAD PART NO. A701672 | BP-16-05 | CM | 1 |
| C115 | CAPACITOR,PLASTIC,0.05UF,10 PCT,400WVDC /POLARAD PART NO. B508825 | 4TM-S50 | BN | 1 |
| C116 | SAME AS C110 | | | |
| C117 AND C118 | NOT USED | | | |
| C119 | CAPACITOR,CERAMIC,0.05UF,20 PCT,500WVDC | 5HK-S50 | BN | 1 |
| C120 | CAPACITOR,PLASTIC,1UF,10 PCT,200WVDC /POLARAD PART NO. B508735 | 2TM-M10 | BN | 1 |
| C121 | SAME AS C110 | | | |
| C122 AND C123 | NOT USED | | | |
| C124 | SAME AS C119 | | | |
| C125 THRU C138 | NOT USED | | | |
| C139 AND C140 | CAPACITOR,ELECTROLYTIC,2000UF,15WVDC /POLARAD PART NO. B706319 | BR200015 | U | 1 |
| C141 AND C142 | CAPACITOR,CERAMIC,1000UUF,10 PCT,1000WVDC /POLARAD PART NO. A701560 | DD-102 | P | 3 |
| C143 THRU C150 | NOT USED | | | |
| C151 | CAPACITOR,PAPER,0.5UF,10 PCT,600WVDC, USED ON MODEL TSA-WF ONLY | CP54B1EF504K | AU | 1 |
| C152 THRU C169 | NOT USED | | | |
| C170 AND C171 | SAME AS C139 | | | |
| C172 | NOT USED | | | |
| C173 | SAME AS C108 | | | |
| C201 | CAPACITOR,MICA,560UUF,5 PCT,300WVDC | CM15C560J | AU | 1 |
| C202 AND C203 | SAME AS C141 | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| C204 | CAPACITOR,MICA,1000UUF,10 PCT,300WVDC, USED ON SERIAL NOS. 595 THRU 634 | CB21QX102K | AU | 1 |
| C204 | CAPACITOR,MICA,1000UUF,10 PCT,500WVDC, /POLARAD PART NO. B706815/USED ON SERIAL NOS. 635 AND UP | 370FC-102K | Y | 1 |
| C205 | CAPACITOR,MICA,43UUF,5 PCT,300WVDC | CM15C430J | AU | 1 |
| C206 AND C207 | SAME AS C141 | | | |
| C208 | CAPACITOR,CERAMIC,0.01UF,PLUS 100 PCT, MINUS 20 PCT,500WVDC,USED ON SERIAL NOS. 595 THRU 634 | CK63Y103Z | AU | 2 |
| C208 | CAPACITOR,CERAMIC,0.01UUF,GMV,600WVDC /POLARAD PART NO. B705176/USED ON SERIAL NOS. 635 AND UP | DD6-103 | P | 2 |
| C209 | SAME AS C141 | | | |
| C210 | NOT USED | | | |
| C211 | CAPACITOR,MICA,120UUF,10 PCT,500WVDC USED ON SERIAL NOS. 595 THRU 634 | DM15E121K | CG | 1 |
| C211 | CAPACITOR,MICA,120UUF,5 PCT,500WVDC /POLARAD PART NO. B703086/USED ON SERIAL NOS. 635 AND UP | DM15F121J | CG | 1 |
| C212 | SAME AS C141 | | | |
| C213 | NOT USED | | | |
| C214 | SAME AS C208,USED ON SERIAL NOS. 595 THRU 634 | | | |
| C214 | SAME AS C208,USED ON SERIAL NOS. 635 AND UP | | | |
| C215 | NOT USED | | | |
| C216 AND C217 | SAME AS C141 | | | |
| C218 AND C219 | SAME AS C208,USED ON SERIAL NOS. 595 THRU 634 | | | |
| C218 AND C219 | SAME AS C208,USED ON SERIAL NOS. 635 AND UP | | | |
| C220 | NOT USED | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| C221 | CAPACITOR,MICA,330UUF,5 PCT,300WVDC | CM15C331J | AU | 1 |
| C222 | SAME AS C204,USED ON SERIAL NOS. 595 THRU 634 | | | |
| C222 | SAME AS C204,USED ON SERIAL NOS. 635 AND UP | | | |
| C223 | SAME AS C141 | | | |
| C224 | CAPACITOR,MICA,180UUF,10 PCT,500WVDC, USED ON SERIAL NOS. 595 THRU 634 | DM15E181K | CG | 1 |
| C224 | CAPACITOR,MICA,180UUF,5 PCT,500WVDC /POLARAD PART NO. 8703090/USED ON SERIAL NOS. 635 AND UP | DM15F181J | CG | 1 |
| C225 | CAPACITOR,MICA,1500UUF,5 PCT,500WVDC | CM30E152J | AU | 1 |
| C226 | SAME AS C204,USED ON SERIAL NOS. 595 THRU 634 | | | |
| C226 | SAME AS C204,USED ON SERIAL NOS. 635 AND UP | | | |
| C227 | CAPACITOR,MICA,47UUF,10 PCT,500WVDC /POLARAD PART NO. 8703022 | DM15E470K | AU | 1 |
| C228 AND C229 | SAME AS C208,USED ON SERIAL NOS. 595 THRU 634 | | | |
| C228 AND C229 | SAME AS C208,USED ON SERIAL NOS. 635 AND UP | | | |
| C230 | NOT USED | | | |
| C231 THRU C233 | SAME AS C208,USED ON SERIAL NOS. 595 THRU 634 | | | |
| C231 THRU C233 | SAME AS C208,USED ON SERIAL NOS. 635 AND UP | | | |
| C234 | SAME AS C221 | | | |
| C235 | SAME AS C141 | | | |
| C236 AND C237 | SAME AS C208,USED ON SERIAL NOS. 595 THRU 634 | | | |
| C236 AND C237 | SAME AS C208,USED ON SERIAL NOS. 635 AND UP | | | |
| C238 | SAME AS C208,USED ON SERIAL NOS. 635 AND UP | | | |
| C239 | SAME AS C208,USED ON SERIAL NOS. 595 THRU 634 | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| C239 | SAME AS C208, USED ON SERIAL NOS. 635 AND UP | | | |
| C240 AND C241 | NOT USED | | | |
| C242 | SAME AS C208, USED ON SERIAL NOS. 595 THRU 634 | | | |
| C242 | SAME AS C208, USED ON SERIAL NOS. 635 AND UP | | | |
| C243 | SAME AS C208, USED ON SERIAL NOS. 635 AND UP | | | |
| C244 | CAPACITOR, CERAMIC, FEED-THRU, 1000UUF, 20 PCT, 500WVDC/POLARAD PART NO. A506409 | 327-102 | Y | 2 |
| C245 | SAME AS C221, USED ON SERIAL NOS. 635 AND UP | | | |
| C246 | CAPACITOR, MICA, 6800UUF, 5 PCT, 300WVDC, USED ON SERIAL NOS. 595 THRU 634 | CM35C682J | AU | 1 |
| C246 | SAME AS C141, USED ON SERIAL NOS. 635 AND UP | | | |
| C247 | SAME AS C208, USED ON SERIAL NOS. 595 THRU 634 | | | |
| C247 | SAME AS C208, USED ON SERIAL NOS. 635 AND UP | | | |
| C248 | SAME AS C244 | | | |
| C249 | CAPACITOR, MICA, 33UUF, 5 PCT, 300WVDC, USED ON SERIAL NOS. 595 THRU 634 | CM15C330J | AU | 1 |
| C249 | CAPACITOR, CERAMIC, 51UUF, 2 PCT, 300WVDC, USED ON SERIAL NOS. 635 AND UP | CC21UJ510G | AU | 1 |
| C250 AND C251 | NOT USED | | | |
| C252 | SAME AS C244 | | | |
| C253 | CAPACITOR, MICA, 22UUF, 10 PCT, 500WVDC | CM15E220K | AU | 1 |
| C254 | SAME AS C227 | | | |
| C255 | SAME AS C141 | | | |
| C301 | CAPACITOR, CERAMIC, 1000UUF, 10 PCT, 500WVDC | 831 | Y | 1 |
| C302 | CAPACITOR, VARIABLE, AIR DIELECTRIC, 3-13UUF /POLARAD PART NO. A106573 | 33800-37 | AD | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| C303 | CAPACITOR,VARIABLE,CERAMIC,1.5-7UUF,500WVDC | 557-A | U | 1 |
| C304 | CAPACITOR,CERAMIC,2.2UUF,0.2UUF TOL,600WVDC | NP0A-2R2 | Y | 1 |
| C305 | CAPACITOR,VARIABLE,CERAMIC,1.5-7UUF, 0.5UUF TOL,600WVDC | 822-EZ | P | 1 |
| C306 THRU C309 | NOT USED | | | |
| C310 | SAME AS C301 | | | |
| C311 | CAPACITOR,CERAMIC,22UUF,20 PCT,600WVDC | GP1K | Y | 1 |
| C312 | CAPACITOR,VARIABLE,AIR DIELECTRIC, 1.5-5UUF,1100WVDC | A121010 | BE | 1 |
| C401 | NOT USED | | | |
| C402 | SAME AS C244 | | | |
| C403 | NOT USED | | | |
| C404 | CAPACITOR,CERAMIC,27UUF,2 PCT,500WVDC | CC20SH270G | AU | 1 |
| C405 | CAPACITOR,CERAMIC,1UUF,10 PCT,500WVDC /POLARAD PART NO. B701922 | GA-1 | CL | 1 |
| C406 | SAME AS C244 | | | |
| C407 THRU C410 | NOT USED | | | |
| C411 AND C412 | CAPACITOR,CERAMIC,47UUF,2 PCT,500WVDC | CC20UJ470G | AU | 1 |
| C413 | SAME AS C244 | | | |
| C414 | CAPACITOR,CERAMIC,4.7UUF,10 PCT,500WVDC /POLARAD PART NO. B701930 | GA-4.7 | CL | 1 |
| C415 | SAME AS C201 | | | |
| C416 | SAME AS C141 | | | |
| C417 | SAME AS C201 | | | |
| C418 THRU C421 | SAME AS C141 | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| C422 | SAME AS C244 | | | |
| C423 | SAME AS C244,USED ON SERIAL NOS. 595 THRU 634 | | | |
| C424 | NOT USED | | | |
| C425 AND C426 | SAME AS C244 | | | |
| C427 | SAME AS C141 | | | |
| C428 | SAME AS C405 | | | |
| C429 | NOT USED | | | |
| C430 THRU C432 | SAME AS C141 | | | |
| C433 | SAME AS C75 | | | |
| C434 | NOT USED | | | |
| C435 | SAME AS C75 | | | |
| C436 | CAPACITOR,CERAMIC,3.3UUF,10 PCT,500WVDC /POLARAD PART NO. B701928 | GA-3.3 | CL | 1 |
| C437 | NOT USED | | | |
| C438 | CAPACITOR,ELECTROLYTIC,8UF,10 PCT,450WVDC /POLARAD PART NO. B703544 | BR8-450 | U | 1 |
| C439 | CAPACITOR,MICA,1000UUF,10 PCT,500WVDC /POLARAD PART NO. B706815 | 370FC-102K | Y | 1 |
| C440 AND C441 | SAME AS C141 | | | |
| C442 | SAME AS C439 | | | |
| C443 AND C444 | SAME AS C141 | | | |
| C445 THRU C454 | NOT USED | | | |
| C455 | CAPACITOR,CERAMIC,0.01UF,GMV,600WVDC /POLARAD PART NO. B705177 | DD-103 | P | 1 |
| C501 | SAME AS C141 | | | |

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| C502 | CAPACITOR,PLASTIC,0.1UF,10 PCT,400WVDC /POLARAD PART NO. B508828 | 4TM-P10 | BN | 1 |
| C503 | CAPACITOR,PLASTIC,0.022UF,10 PCT,400WVDC /POLARAD PART NO. B508819 | 4TM-S22 | BN | 1 |
| C504 | CAPACITOR,PLASTIC,0.02UF,10 PCT,400WVDC /POLARAD PART NO. B508818 | 4TM-S20 | BN | 1 |
| C505 | SAME AS C115 | | | |
| C506 | CAPACITOR,PAPER,1UF,10 PCT,600WVDC | CP61B1FF105K | AU | 1 |
| C507 | CAPACITOR,PLASTIC,0.01UF,10 PCT,400WVDC /POLARAD PART NO. B508816 | 4TM-S10 | AU | 1 |
| C508 | CAPACITOR,CERAMIC,0.1UF,20 PCT,500WVDC | 5HK-P10 | BN | 1 |
| C509 | CAPACITOR,MICA,33UUF,5 PCT,300WVDC | CM15C330J | AU | 1 |
| C510 | NOT USED | | | |
| C511 | CAPACITOR,MICA,150UF,5 PCT,300WVDC | CM15C150J | AU | 1 |
| C512 | CAPACITOR,VARIABLE,CERAMIC,7-45UUF,500WVDC | CV11C450 | AU | 1 |
| C513 | SAME AS C508 | | | |
| C514 | CAPACITOR,PAPER,1UF,PLUS 20 PCT, MINUS 10 PCT,200WVDC/POLARAD PART NO. 508735 | 330210 | BL | 1 |
| C515 | NOT USED | | | |
| C516 | SAME AS C75,USED ON MODEL TSA-WF ONLY | | | |
| C516 | CAPACITOR,CERAMIC,0.03UF,PLUS 80 PCT, MINUS 20 PCT,600WVDC/POLARAD PART NO. B705179 | DD-303 | P | 1 |
| C601 THRU C615 | NOT USED | | | |
| C616 C617 | SAME AS C75 | | | |
| C618 | SAME AS C455 | | | |
| C619 | SAME AS C141 | | | |
| C620 | NOT USED | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| C621 | CAPACITOR,MICA,1000UUF,U0 PCT,1000WVDC | VCM20B102K | U | 1 |
| C622 AND C623 | CAPACITOR,CERAMIC,0.01UF 20 PCT,3000WVDC /POLARAD PART NO.A700582 | 41C121A2 | BN | 1 |
| C624 AND C625 | NOT USED | | | |
| C626 AND C627 | CAPACITOR,PLASTIC,0.1UF,10 PCT,3000WVDC | D6-30-100 | DV | 1 |
| C701 THRU C705 | CAPACITOR,CERAMIC,1000UUF,PLUS 100 PCT, MINUS 20 PCT,500WVDC | CK61Y102Z | AU | 3 |
| C706 | SAME AS C439 | | | |
| C707 THRU C727 | SAME AS C701 | | | |
| C728 THRU C730 | SAME AS C244 | | | |
| C731 THRU C738 | NOT USED | | | |
| C739 | CAPACITOR,CERAMIC,0.56UUF,10 PCT,500WVDC /POLARAD PART NO. B701919 | GA-.56 | CL | 1 |
| C740 | NOT USED | | | |
| C741 | CAPACITOR,VARIABLE,CERAMIC,1.5-12.5UUF, 500WVDC/POLARAD PART NO. A107118 | PCST-50 | CH | 1 |
| C801 | CAPACITOR,CERAMIC,TEMP COMP, 51UUF,0.5UUF TOL,600WVDC | TCN-51 | P | 1 |
| C802 AND C803 | CAPACITOR,VARIABLE,CERAMIC,3-13UUF,500WVDC | CV11A130 | Y | 1 |
| C804 THRU C806 | CAPACITOR,CERAMIC,0.01UF,20 PCT,1000WVDC | 5HK-S10 | BN | 1 |
| C807 | SAME AS C244 | | | |
| C808 | SAME AS C804 | | | |
| C809 AND C810 | SAME AS C141 | | | |
| C811 | SAME AS C804 | | | |

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| C812 | SAME AS C244 | | | |
| DS1 THRU DS75 | NOT USED | | | |
| DS76 | LAMP,INCANDESCENT,6-8V,BAYONET BASE | 328 | CK | 1 |
| DS77 THRU DS80 | LAMP,INCANDESCENT,6-8V,BAYONET BASE /POLARAD PART NO. 005237 | 47 | CK | 1 |
| FE201 THRU FE203 | FERRITE BEAD/POLARAD PART NO. A115516 | 56-590-65/3B | DK | 1 |
| FE301 AND FE302 | SAME AS FE201 | | | |
| FE401 THRU FE405 | SAME AS FE201 | | | |
| FE406 | SAME AS FE201,USED ON SERIAL NOS. 635 AND UP | | | |
| FE701 THRU FE705 | SAME AS FE201 | | | |
| FE801 AND FE802 | SAME AS FE201 | | | |
| FL301 AND FL302 | FILTER,RF,2500UUF,20 PCT,500WVDC /POLARAD PART NO. A118602 | FIB | D | 1 |
| F101 AND F102 | FUSE,CARTRIDGE,6.25 AMP /POLARAD PART NO. B704813 | MDL-6.25 | EG | 2 |
| F103 | FUSE,CARTRIDGE,DELAY,2 AMP,3AG | MS90078-26 | AV | 1 |
| F104 | FUSE,CARTRIDGE,DELAY,3 AMP,3AG | MS90078-27 | AV | 1 |
| H101 THRU H103 | KNOB/POLARAD PART NO. 517206 | 70-2-2 | BN | 1 |
| H104 | KNOB/POLARAD PART NO. 517211 | 70-3-2 | BH | 1 |
| H105 | KNOB/POLARAD PART NO. 507403 | 70-5-2 | BH | 1 |
| H106 | KNOB | A138396 | BE | 1 |
| H107 AND H108 | KNOB | A138335 | BE | 1 |
| H109 AND H110 | KNOB | A115356 | BE | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| H111 THRU H113 | KNOB | A132301 | BE | 1 |
| H114 | SAME AS H105 | | | |
| H115 THRU H118 | KNOB/POLARAD PART NO. A132300 | 90-1-2 | BH | 1 |
| H119 AND H120 | KNOB/POLARAD PART NO. A132299 | 70-1-2 | BH | 1 |
| J1 THRU J74 | NOT USED | | | |
| J75 THRU J78 | CONNECTOR,RECEPTACLE,FEMALE,BNC TYPE | UG-625/U | AU | 2 |
| J79 THRU J84 | NOT USED | | | |
| J85 AND J86 | CONNECTOR,PLUG,FEMALE,BNC TYPE | UG-909/U | AU | 1 |
| J101 THRU J124 | NOT USED | | | |
| J125 | CONNECTOR,RECEPTACLE,FEMALE,34 PINS /POLARAD PART NO. 516112 | MRE-34S-G | CC | 1 |
| J126 | NOT USED | | | |
| J127 | CONNECTOR,RECEPTACLE,MALE,3 PINS /POLARAD PART NO. A700010 | 7486 | AE | 1 |
| J128 | CONNECTOR,PLUG,MALE,3 PINS /POLARAD PART NO. AK50123 | 91-MPM3S | F | 1 |
| J201 AND J202 | SAME AS J75 | | | |
| J203 | CONNECTOR,RECEPTACLE,FEMALE,7 PINS /POLARAD PART NO. B516005 | A7S | CC | 1 |
| J203 | SAME AS J75,USED ON SERIAL NOS. 595 THRU 634 | | | |
| J204 | SAME AS J75 | | | |
| J205 | SAME AS J75,USED ON SERIAL NOS. 635 AND UP | | | |
| J301 | SAME AS J203,PART NO. A7S | | | |

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| J302 | SAME AS J75•WITH COIL L304 | | | |
| J401 | CONNECTOR•RECEPTACLE•FEMALE•15 PINS /POLARAD PART NO• 516007 | A15S | CC | 1 |
| J402 THRU J404 | SAME AS J75 | | | |
| J501 AND J502 | SAME AS J75 | | | |
| J503 | CONNECTOR•PLUG•MALE•26 PINS /POLARAD PART NOS•A139046 | MRE-26P-G | CC | 1 |
| J504 | SAME AS J203•PART NO• A7S | | | |
| J601 THRU J610 | NOT USED | | | |
| J611 | SAME AS J401 | | | |
| J701 THRU J703 | SAME AS J75 | | | |
| J704 | SAME AS J203•PART NO• A7S | | | |
| J801 | CONNECTOR•RECEPTACLE•FEMALE•BNC TYPE | UG-625A/U | AU | 1 |
| J802 | CONNECTOR•RECEPTACLE•FEMALE•BNC TYPE•RT•ANGLE | UG-1098/U | AU | 1 |
| J803 | CONNECTOR•RECEPTACLE•FEMALE•5 PINS /POLARAD PART NO• C509729 | M5S-LRN | CC | 1 |
| K101 | RELAY•THERMAL•DELAY•SPST•115VAC | 115N060T | E | 1 |
| K102 | RELAY•ARMATURE•DPDT | DOX-46T | AZ | 1 |
| K501 | RELAY•ARMATURE•3PDT•110VAC /POLARAD PART NO• A135339 | XM-310 | DU | 1 |
| L201 | NOT USED | | | |
| L202 | COIL•RF•VARIABLE | A100969 | BE | 1 |
| L203 | COIL•RF•5UH | A100676 | BE | 1 |
| L204 | NOT USED | | | |
| L205 | COIL•RF•VARIABLE | A100822 | BE | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| L206 | NOT USED | | | |
| L207 | COIL,RF,50UH | A101170 | BE | 1 |
| L208 | NOT USED | | | |
| L209 | COIL,RF,VARIABLE | A111193 | BE | 1 |
| L210 | NOT USED | | | |
| L211 | COIL,RF,100UH | A101169 | BE | 1 |
| L212 | SAME AS L203 | | | |
| L213 | COIL,RF,VARIABLE<br>USED ON SERIAL NOS. 595 THRU 634 | A116977 | BE | 1 |
| L213 | COIL,RF,VARIABLE,<br>USED ON SERIAL NOS. 635 AND UP | A100970 | BE | 1 |
| L214 | NOT USED | | | |
| L215 | SAME AS L203 | | | |
| L216 | SAME AS L209 | | | |
| L217 AND L218 | SAME AS L211 | | | |
| L219 | SAME AS L209,USED ON SERIAL NOS. 635 AND UP | | | |
| L220 | NOT USED | | | |
| L221 | SAME AS L211 | | | |
| L222 | COIL,RF,5MH,USED ON SERIAL NOS. 595 THRU 634 | M50 | DC | 1 |
| L222 | COIL,RF,2.5MH/POLARAD PART NO. A106494/<br>USED ON SERIAL NOS. 635 AND UP | R50 | DC | 1 |
| L223 | COIL,RF,VARIABLE ASSY,USED ON<br>SERIAL NOS. 595 THRU 634 | B141458 | BE | 1 |
| L223 | SAME AS L211,USED ON SERIAL NOS. 635 AND UP | | | |
| L224 | NOT USED | | | |
| L225 | COIL,RF,USED ON SERIAL NOS. 635 AND UP | A146633 | BE | 1 |

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| L301 | NON-REPLACEABLE PART OF L302 | | | |
| L302 | COIL,RF,5UH,WITH COIL L301 | ASK13335 | BE | 1 |
| L303 | COIL,RF,VARIABLE | ASK13336 | BE | 1 |
| L304 | NON-REPLACEABLE PART OF J302 | | | |
| L401 | COIL,RF,10MH,USED ON SERIAL NOS. 635 AND UP | A146621 | BE | 1 |
| L402 | NOT USED | | | |
| L403 | REACTOR,INDUCTIVELY COUPLED TO L405 | B111355 | BE | 1 |
| L404 | NOT USED | | | |
| L405 | REACTOR,INDUCTIVELY COUPLED TO L403 | A127996 | BE | 1 |
| L406 | COIL,RF,VARIABLE | A127659 | BE | 1 |
| L407 | COIL,RF | A127997 | BE | 1 |
| L408 | COIL,RF,VARIABLE | A127660 | BE | 1 |
| L409 | COIL,RF,VARIABLE | A131643 | BE | 1 |
| L410 AND L411 | COIL,RF,0.8UH | A100674 | BE | 1 |
| L501 | COIL,RF,2.5UH | M-25 | DC | 1 |
| L601 | COIL,RF,4.7MH | R40-4-7 | DE | 1 |
| L701 | COIL,RF,VARIABLE | A127094 | BE | 1 |
| L702 | COIL,RF,VARIABLE | A127096 | BE | 1 |
| L703 | COIL,RF,VARIABLE | A127095 | BE | 1 |
| L704 | SAME AS L702 | | | |
| L705 | SAME AS L703 | | | |
| L706 | SAME AS L702 | | | |
| L707 | COIL,RF,VARIABLE | A127097 | BE | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| L708 | COIL,RF | A114575 | BE | 1 |
| L709 | COIL,RF | A132585 | BE | 1 |
| L710 | COIL,RF | A127099 | BE | 1 |
| L711 | COIL,RF | A127098 | BE | 1 |
| L712 | COIL,RF | A127101 | BE | 1 |
| L713 | SAME AS L711 | | | |
| L714 | SAME AS L712 | | | |
| L715 | SAME AS L711 | | | |
| L716 | SAME AS L712 | | | |
| L717 AND L718 | COIL,RF,0.6UH | AP21030-3 | BE | 1 |
| L719 | COIL,RF | A144026 | BE | 1 |
| L801 AND L802 | NOT USED | | | |
| L803 | COIL,RF,VARIABLE | B141448 | BE | 1 |
| L804 THRU L806 | SAME AS L207 | | | |
| MP1 | SCALE,CRT,CALIBRATED | BP21124 | BE | 1 |
| MP2 | SHIELD,CRT,SPECIAL PURPOSE | BP18588 | BE | 1 |
| MP3 | BEZEL,CRT | CP19495 | BE | 1 |
| MP4 | FILTER,CRT,BLUE | B27336-2 | BE | 1 |
| P1 THRU P84 | NOT USED | | | |
| P85 AND P86 | CONNECTOR,PLUG,MALE,BNC TYPE /POLARAD PART NO.A701977 | 8525 | CX | 1 |
| P101 THRU P103 | NOT USED | | | |
| P104 | CONNECTOR,PLUG,FEMALE,18 PINS,WITH HOOD A18-H | SA18S-H | CC | 1 |

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| P105 THRU P124 | NOT USED | | | |
| P125 | CONNECTOR,PLUG,MALE,34 PINS,WITH HOOD MRE-34H /POLARAD PART NO. A516111 | MRE-34P-G | CC | 1 |
| P126 AND P127 | NOT USED | | | |
| P128 | CONNECTOR,PLUG,FEMALE,3 PINS /POLARAD PART NO. AK50124 | 91-MPF3S | F | 1 |
| P201 AND P202 | CONNECTOR,PLUG,MALE,BNC TYPE | UG-260/U | AU | 1 |
| P203 | CONNECTOR,PLUG,MALE,7 PINS,WITH HOOD A7H | A7P-H | CC | 1 |
| P203 | CONNECTOR,PLUG,MALE,BNC TYPE, USED ON SERIAL NOS. 595 THRU 634 | UG-88/U | AU | 1 |
| P204 | CONNECTOR,PLUG,MALE,BNC TYPE | UG-88/U | AU | 1 |
| P205 | SAME AS P204,USED ON SERIAL NOS. 635 AND UP | | | |
| P301 | SAME AS P203,PART NO. A7P-H | | | |
| P302 | SAME AS P204 | | | |
| P401 | CONNECTOR,PLUG,MALE,15 PINS,WITH HOOD A15H | A15P-H | CC | 1 |
| P402 AND P403 | SAME AS P201 | | | |
| P404 | SAME AS P204 | | | |
| P501 AND P502 | SAME AS P201 | | | |
| P503 | CONNECTOR,PLUG,FEMALE,26 PINS, WITH HOOD MRE-26H-1 | MRE-26S-G | CC | 1 |
| P504 | SAME AS P203,PART NO. A7P-H | | | |
| P601 THRU P606 | NOT USED | | | |
| P607 | SAME AS P201 | | | |
| P608 THRU P610 | NOT USED | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| P611 | SAME AS P401 | | | |
| P701 | SAME AS P201 | | | |
| P702 AND P703 | SAME AS P204 | | | |
| P704 | SAME AS P203•PART NO• A7P-H | | | |
| P801 AND P802 | SAME AS P204 | | | |
| P803 | CONNECTOR•PLUG•MALE•5 PINS•WITH HOOD /POLARAD PART NO• C509706 | M5P-LSH19C | CC | 1 |
| Q101 | TRANSISTOR•PNP•GERMANIUM | 2N277 | CK | 1 |
| R1 THRU R75 | NOT USED | | | |
| R76 | RESISTOR•VARIABLE•COMPOSITION•500K•10 PCT•2W /POLARAD PART NO• 517927 | RV4NAXSD504A | AU | 1 |
| R77 | RESISTOR•VARIABLE•WW•10 OHMS•10 PCT•5W | A129119 | BE | 1 |
| R78 | RESISTOR•VARIABLE•COMPOSITION•500K•10 PCT•2W /POLARAD PART NO• 517916 | RVNAXSB504A | AU | 1 |
| R79 | RESISTOR•VARIABLE•COMPOSITION•5 MEGO•20 PCT• 2W/POLARAD PART NO• 517922 | RV4NAXSB505B | AU | 1 |
| R80 | NOT USED | | | |
| R81 | SAME AS R76•USED ON SERIAL NOS• 635 AND UP | | | |
| R101 | RESISTOR•COMPOSITION•0•1K•10 PCT•1/2W | RC20GF101K | AU | 3 |
| R102 | RESISTOR•COMPOSITION•470K•10 PCT•1/2W | RC20GF474K | AU | 2 |
| R103 | SAME AS R101 | | | |
| R104 | RESISTOR•COMPOSITION•33K•10 PCT•1W | RC32GF333K | AU | 1 |
| R105 | RESISTOR•COMPOSITION•8•2K•10 PCT•2W | RC42GF822K | AU | 1 |
| R106 | RESISTOR•COMPOSITION•220K•10 PCT•1/2W | RC20GF224K | AU | 1 |
| R107 AND R108 | RESISTOR•COMPOSITION•68K•10 PCT•2W | RC42GF683K | AU | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| R109 AND R110 | RESISTOR,WW,30K,5 PCT,10W | 10KT-30K | BN | 1 |
| R111 | SAME AS R101 | | | |
| R112 | SAME AS R109 | | | |
| R113 | SAME AS R101 | | | |
| R114 | SAME AS R106 | | | |
| R115 | RESISTOR,COMPOSITION,82K,10 PCT,2W | RC42GF823K | AU | 1 |
| R116 | SAME AS R104 | | | |
| R117 | RESISTOR,VARIABLE,COMPOSITION,50K,10 PCT,2W /POLARAD PART NO. 517853 | RV4NAXSD503A | AU | 1 |
| R118 | RESISTOR,FILM,0.1K,1 PCT,1W | MDF-100 | DU | 1 |
| R119 | SAME AS R104 | | | |
| R120 | NOT USED | | | |
| R121 | SAME AS R115 | | | |
| R122 | RESISTOR,COMPOSITION,22K,10 PCT,2W | RC42GF223K | AU | 1 |
| R123 | SAME AS R117 | | | |
| R124 | RESISTOR,WW,25K,5 PCT,10W | 10KT-25K | BN | 1 |
| R125 AND R126 | RESISTOR,COMPOSITION,47 OHMS,10 PCT,2W | RC42GF470K | AU | 1 |
| R127 | NOT USED | | | |
| R128 AND R129 | SAME AS R102 | | | |
| R130 | SAME AS R124 | | | |
| R131 | SAME AS R102,USED ON SERIAL NOS. 635 AND UP | | | |
| R132 AND R133 | SAME AS R125 | | | |
| R134 | SAME AS R102,USED ON SERIAL NOS. 635 AND UP | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| R135 | NOT USED | | | |
| R136 AND R137 | SAME AS R125 | | | |
| R138 | NOT USED | | | |
| R139 | RESISTOR,COMPOSITION,47K,10 PCT,1W | RC32GF473K | AU | 1 |
| R140 AND R141 | NOT USED | | | |
| R142 | RESISTOR,COMPOSITION,220K,10 PCT,2W | RC42GF224K | AU | 1 |
| R143 | RESISTOR,VARIABLE,COMPOSITION,25K,10 PCT,2W /POLARAD PART NO. 517851 | RV4NAXSD253A | AU | 1 |
| R144 | RESISTOR,COMPOSITION,75K,5 PCT,1/2W | RC20GF753J | AU | 1 |
| R145 | SAME AS R102 | | | |
| R146 | SAME AS R139 | | | |
| R147 | RESISTOR,VARIABLE,COMPOSITION,10K,10 PCT,2W /POLARAD PART NO. 517849 | RV4NAXSD103A | AU | 1 |
| R148 | SAME AS R139 | | | |
| R149 | RESISTOR,COMPOSITION,68K,10 PCT,1/2W | RC20GF683K | AU | 1 |
| R150 | NOT USED | | | |
| R151 | RESISTOR,COMPOSITION,120K,10 PCT,1/2W | RC20GF124K | AU | 1 |
| R152 | RESISTOR,COMPOSITION,1 MEGO,10 PCT,1/2W | RC20GF105K | AU | 1 |
| R153 | RESISTOR,COMPOSITION,180K,10 PCT,1/2W | RC20GF184K | AU | 1 |
| R154 | RESISTOR,VARIABLE,COMPOSITION,100K,10 PCT,2W /POLARAD PART NO. 517923 | RV4NAXSD104A | AU | 1 |
| R155 | RESISTOR,COMPOSITION,100K,10 PCT,1/2W | RC20GF104K | AU | 2 |
| R156 | SAME AS R76,USED ON SERIAL NOS. 595 THRU 634 | | | |
| R157 AND R158 | RESISTOR,COMPOSITION,68 OHMS,10 PCT,2W | RC42GF680K | AU | 1 |
| R159 THRU R168 | NOT USED | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| R169 | SAME AS R102 | | | |
| R170 | RESISTOR,WW,1 OHM,5 PCT,5W /POLARAD PART NO. A702195 | 1-D-48-F-1 | AZ | 1 |
| R171 | RESISTOR,COMPOSITION,100K,10 PCT,1W | RC32GF104K | AU | 1 |
| R172 | SAME AS R170 | | | |
| R173 THRU R183 | NOT USED | | | |
| R184 | RESISTOR,COMPOSITION,1K,10 PCT,1/2W | RC20GF102K | AU | 1 |
| R185 | NOT USED | | | |
| R186 | SAME AS R102 | | | |
| R187 | NOT USED | | | |
| R188 | SAME AS R104 | | | |
| R189 THRU R193 | NOT USED | | | |
| R194 | RESISTOR,COMPOSITION,56K,10 PCT,2W | RC42GF563K | AU | 1 |
| R195 | RESISTOR,COMPOSITION,820 OHMS,10 PCT,2W, USED ON MODEL TSA-WF ONLY | RC42GF821K | AU | 1 |
| R201 | RESISTOR,COMPOSITION,4.7K,10 PCT,1/2W | RC20GF472K | AU | 1 |
| R202 | RESISTOR,COMPOSITION,10K,10 PCT,1/2W | RC20GF103K | AU | 1 |
| R203 | RESISTOR,COMPOSITION,2.2K,10 PCT,1W | RC32GF222K | AU | 1 |
| R204 | SAME AS R101 | | | |
| R205 | RESISTOR,COMPOSITION,150 OHMS,10 PCT,1/2W | RC20GF151K | AU | 1 |
| R206 | RESISTOR,COMPOSITION,22K,10 PCT,1/2W | RC20GF223K | AU | 1 |
| R207 | SAME AS R203 | | | |
| R208 | RESISTOR,COMPOSITION,10 OHMS,10 PCT,1/2W | RC20GF100K | AU | 1 |
| R209 | SAME AS R205 | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| R210 | NOT USED | | | |
| R211 | SAME AS R206 | | | |
| R212 | RESISTOR,COMPOSITION,3.3K,10 PCT,1/2W | RC20GF332K | AU | 1 |
| R213 | RESISTOR,COMPOSITION,220 OHMS,10 PCT,1/2W | RC20GF221K | AU | 1 |
| R214 | RESISTOR,COMPOSITION,820 OHMS,10 PCT,1/2W | RC20GF821K | AU | 1 |
| R215 | SAME AS R212 | | | |
| R216 | SAME AS R213 | | | |
| R217 | SAME AS R212,USED ON SERIAL NOS. 635 AND UP | | | |
| R218 | SAME AS R214 | | | |
| R219 | RESISTOR,COMPOSITION,56K,10 PCT,1/2W, USED ON SERIAL NOS. 595 THRU 634 | RC20GF563K | AU | 1 |
| R219 | RESISTOR,COMPOSITION,33K,10 PCT,1/2W, USED ON SERIAL NOS. 635 AND UP | RC20GF333K | AU | 1 |
| R220 THRU R222 | NOT USED | | | |
| R223 | SAME AS R202,USED ON SERIAL NOS. 595 THRU 634 | | | |
| R224 | SAME AS R212 | | | |
| R225 | SAME AS R155,USED ON SERIAL NOS. 635 AND UP | | | |
| R301 | SAME AS R202 | | | |
| R302 | RESISTOR,COMPOSITION,3.3K,10 PCT,2W | RC42GF332K | AU | 1 |
| R303 | NOT USED | | | |
| R304 | RESISTOR,VARIABLE,COMPOSITION,500 OHMS, 10 PCT,2W | A128287 | BE | 1 |
| R401 | NOT USED | | | |
| R402 | RESISTOR,WW,12K,5 PCT,5W /POLARAD PART NO.B706609 | 246E1235 | BN | 1 |
| R403 | SAME AS R117 | | | |

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| R404 | NOT USED | | | |
| R405 | RESISTOR,COMPOSITION,150K,10 PCT,1/2W | RC20GF154K | AU | 1 |
| R406 | SAME AS R102,USED ON SERIAL NOS. 595 THRU 634 | | | |
| R406 | SAME AS R106,USED ON SERIAL NOS. 635 AND UP | | | |
| R407 THRU R410 | NOT USED | | | |
| R411 | RESISTOR,COMPOSITION,4.7K,10 PCT,2W | RC42GF472K | AU | 1 |
| R412 | SAME AS R184 | | | |
| R413 | RESISTOR,COMPOSITION,27K,10 PCT,1/2W | RC20GF273K | AU | 1 |
| R414 THRU R417 | NOT USED | | | |
| R418 AND R419 | SAME AS R413 | | | |
| R420 | RESISTOR,COMPOSITION,470 OHMS,10 PCT,1W | RC32GF471K | AU | 1 |
| R421 | RESISTOR,COMPOSITION,1.5K,10 PCT,1/2W | RC20GF152K | AU | 1 |
| R422 | RESISTOR,COMPOSITION,51 OHMS,5 PCT,1/2W | RC20GF510J | AU | 1 |
| R423 | SAME AS R101 | | | |
| R424 | SAME AS R184 | | | |
| R425 | RESISTOR,COMPOSITION,0.1K,10 PCT,2W | RC42GF101K | AU | 1 |
| R426 THRU R431 | NOT USED | | | |
| R432 | RESISTOR,COMPOSITION,82 OHMS,5 PCT,1/2W | RC20GF820J | AU | 1 |
| R433 | NOT USED | | | |
| R434 | RESISTOR,COMPOSITION,47K,10 PCT,1/2W, USED ON SERIAL NOS. 595 THRU 634 | RC20GF473K | AU | 1 |
| R501 | RESISTOR,COMPOSITION,12K,10 PCT,1/2W | RC20GF123K | AU | 1 |
| R502 | SAME AS R102 | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| R503 | SAME AS R151 | | | |
| R504 | RESISTOR,COMPOSITION,3.9 MEGO,10 PCT,1/2W | RC20GF395K | AU | 1 |
| R505 | RESISTOR,VARIABLE,COMPOSITION,DUAL SECT, SECT A,1 MEGO,20 PCT,SECT B,25K,10 PCT, 2W,BOTH SECT | A138397 | BE | 1 |
| R506 | SAME AS R101 | | | |
| R507 | RESISTOR,COMPOSITION,33K,10 PCT,1/2W | RC20GF333K | AU | 1 |
| R508 | RESISTOR,VARIABLE,COMPOSITION,50K,10 PCT,1/2W | B116362 | BE | 1 |
| R509 | RESISTOR,COMPOSITION,56K,10 PCT,1/2W | RC20GF563K | AU | 1 |
| R510 | SAME AS R184 | | | |
| R511 | SAME AS R508 | | | |
| R512 | RESISTOR,VARIABLE,COMPOSITION,25K,10 PCT,1/2W | B116361 | BE | 1 |
| R513 | SAME AS R152 | | | |
| R514 | RESISTOR,COMPOSITION,270K,10 PCT,1/2W | RC20GF274K | AU | 1 |
| R515 | SAME AS R512 | | | |
| R516 | RESISTOR,COMPOSITION,18K,10 PCT,1/2W | RC20GF183K | AU | 1 |
| R517 | RESISTOR,COMPOSITION,10K,10 PCT,2W | RC42GF103K | AU | 1 |
| R518 | RESISTOR,COMPOSITION,47K,10 PCT,1/2W | RC20GF473K | AU | 1 |
| R519 | SAME AS R206 | | | |
| R520 | SAME AS R195 | | | |
| R521 | RESISTOR,COMPOSITION,680K,10 PCT,1/2W | RC20GF684K | AU | 1 |
| R522 | SAME AS R122 | | | |
| R523 | SAME AS R151 | | | |
| R524 | SAME AS R501 | | | |
| R525 | SAME AS R202 | | | |

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| R526 AND R527 | SAME AS R107 | | | |
| R528 | RESISTOR,VARIABLE,COMPOSITION, DUAL CONC,SECT A,50K,SECT B,1 MEGO, 20 PCT,1/2W,BOTH SECT | A133086 | BE | 1 |
| R529 | SAME AS R155 | | | |
| R530 | NOT USED | | | |
| R531 | SAME AS R509 | | | |
| R532 | SAME AS R155 | | | |
| R533 | SAME AS R514 | | | |
| R534 | SAME AS R405 | | | |
| R535 | SAME AS R149 | | | |
| R536 | RESISTOR,VARIABLE,COMPOSITION, 1 MEGO,10 PCT,1/2W | B116364 | BE | 1 |
| R537 | RESISTOR,VARIABLE,COMPOSITION, 2,5 MEGO,10 PCT,1/2W | B116365 | BE | 1 |
| R538 | RESISTOR AND SWITCH ASSY,S502 | C111709 | BE | 1 |
| R539 | RESISTOR,COMPOSITION,470 OHMS,10 PCT,1/2W | RC20GF471K | AU | 1 |
| R540 | NOT USED | | | |
| R541 | RESISTOR,WW,4K,5 PCT,10W | 10KR-4K | BN | 1 |
| R542 | RESISTOR,COMPOSITION,2,7K,10 PCT,2W | RC42GF272K | AU | 1 |
| R543 | SAME AS R151 | | | |
| R544 | SAME AS R104 | | | |
| R545 | SAME AS R507 | | | |
| R546 | SAME AS R152 | | | |
| R547 | RESISTOR,COMPOSITION,15K,10 PCT,1/2W | RC20GF153K | AU | 1 |
| R548 | RESISTOR,COMPOSITION,2,2K,10 PCT,1/2W | RC20GF222K | AU | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| R549 | SAME AS R508 | | | |
| R550 | NOT USED | | | |
| R551 | SAME AS R509 | | | |
| R552 | RESISTOR,COMPOSITION,15K,10 PCT,1W | RC32GF153K | AU | 1 |
| R553 AND R554 | SAME AS R155 | | | |
| R555 | RESISTOR,VARIABLE,COMPOSITION, 100K,10 PCT,1/2W | B131658 | BE | 1 |
| R556 | SAME AS R194 | | | |
| R557 | RESISTOR,COMPOSITION,820K,10 PCT,1/2W USED ON SERIAL NOS. 635 AND UP | RC20GF824K | AU | 1 |
| R557 | SAME AS R434 | | | |
| R558 | SAME AS R405,USED ON SERIAL NOS. 595 THRU 634 | | | |
| R558 | SAME AS R152,USED ON SERIAL NOS. 635 AND UP | | | |
| R559 | RESISTOR,COMPOSITION,33K,5 PCT,2W | RC42GF333J | AU | 1 |
| R560 | NOT USED | | | |
| R561 | RESISTOR,COMPOSITION,3.3K,5 PCT,1/2W, USED ON SERIAL NOS. 595 THRU 634 | RC20GF332J | AU | 1 |
| R561 | RESISTOR,COMPOSITION,3K,5 PCT,1/2W, USED ON SERIAL NOS. 635 AND UP | RC20GF302J | AU | 1 |
| R562 | RESISTOR,COMPOSITION,91K,5 PCT,1/2W | RC20GF913J | AU | 1 |
| R563 | RESISTOR,COMPOSITION,5.1K,5 PCT,1/2W | RC20GF512J | AU | 1 |
| R564 | RESISTOR,COMPOSITION,180K,5 PCT,1/2W | RC20GF184J | AU | 1 |
| R565 | RESISTOR,COMPOSITION,8.2K,5 PCT,1/2W | RC20GF822J | AU | 1 |
| R566 | RESISTOR,COMPOSITION,330K,5 PCT,1/2W | RC20GF334J | AU | 1 |
| R567 | RESISTOR,COMPOSITION,13K,5 PCT,1/2W | RC20GF133J | AU | 1 |
| R568 | RESISTOR,COMPOSITION,750K,5 PCT,1/2W | RC20GF754J | AU | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| R569 | RESISTOR,COMPOSITION,22K,5 PCT,1/2W | RC20GF223J | AU | 1 |
| R570 | NOT USED | | | |
| R571 | RESISTOR,COMPOSITION,1.8 MEGO,5 PCT,1/2W | RC20GF185J | AU | 1 |
| R572 | RESISTOR,COMPOSITION,20K,5 PCT,1/2W | RC20GF203J | AU | 1 |
| R573 | RESISTOR,COMPOSITION,3.3 MEGO,5 PCT,1/2W | RC20GF335J | AU | 1 |
| R574 | SAME AS R152 | | | |
| R575 AND R576 | RESISTOR,COMPOSITION,39K,10 PCT,2W | RC42GF393K | AU | 1 |
| R577 AND R578 | RESISTOR,COMPOSITION,680 OHMS,10 PCT,1W | RC32GF681K | AU | 1 |
| R579 | RESISTOR,COMPOSITION,15K,10 PCT,2W | RC42GF153K | AU | 1 |
| R580 | NOT USED | | | |
| R581 | SAME AS R514 | | | |
| R582 | RESISTOR,COMPOSITION,270K,5 PCT,1/2W | RC20GF274J | AU | 1 |
| R583 | RESISTOR,VARIABLE,COMPOSITION, DUAL CONC,SECT A,50K,SECT B,5K, 20 PCT,1/2W,BOTH SECT | A133087 | BE | 1 |
| R584 | SAME AS R566 | | | |
| R585 | RESISTOR,VARIABLE,COMPOSITION, 250K,10 PCT,1/2W | B131659 | BE | 1 |
| R586 | RESISTOR,VARIABLE,COMPOSITION,DUAL SECT, SECT A,25K SECT B,1K,20 PCT,1/2W,BOTH SECT /POLARAD PART NOS,A702166 | C2-35 | DR | 1 |
| R587 | SAME AS R555 | | | |
| R588 | SAME AS R201 | | | |
| R589 | RESISTOR,VARIABLE,COMPOSITION, 1 MEGO,10 PCT,2W | A129111 | BE | 1 |
| R590 AND R591 | NOT USED | | | |
| R592 | SAME AS R509 | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| R593 AND R594 | NOT USED | | | |
| R595 | SAME AS R559 | | | |
| R596 | SAME AS R102 | | | |
| R597 | SAME AS R155 | | | |
| R598 | NOT USED | | | |
| R599 | SAME AS R573 | | | |
| R601 THRU R647 | NOT USED | | | |
| R648 | RESISTOR,COMPOSITION,330 OHMS,10 PCT,2W | RC42GF331K | AU | 1 |
| R649 | RESISTOR,COMPOSITION,27K,10 PCT,2W | RC42GF273K | AU | 1 |
| R650 | NOT USED | | | |
| R651 | SAME AS R425 | | | |
| R652 | SAME AS R155 | | | |
| R653 | SAME AS R184 | | | |
| R654 AND R655 | RESISTOR,COMPOSITION,2.7 OHMS,5 PCT,1W | RC32GF2R7J | AU | 1 |
| R656 THRU R660 | NOT USED | | | |
| R661 | RESISTOR,COMPOSITION,50 MEGO,15 PCT,2W | BBM-508 | CZ | 1 |
| R662 AND R663 | NOT USED | | | |
| R664 | SAME AS R405 | | | |
| R665 | RESISTOR,COMPOSITION,3.9 MEGO,10 PCT,1W | RC32GF395K | AU | 1 |
| R666 THRU R668 | NOT USED | | | |
| R669 | SAME AS R665 | | | |
| R670 | NOT USED | | | |

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| R671 | SAME AS R665 | | | |
| R672 | RESISTOR,COMPOSITION,1.5 MEGO,10 PCT,1/2W | RC20GF155K | AU | 1 |
| R701 THRU R703 | RESISTOR,COMPOSITION,270 OHMS,10 PCT,1/2W | RC20GF271K | AU | 1 |
| R704 | SAME AS R101 | | | |
| R705 | RESISTOR,COMPOSITION,68 OHMS,10 PCT,1/2W | RC20GF680K | AU | 1 |
| R706 | SAME AS R101 | | | |
| R707 | RESISTOR,COMPOSITION,560 OHMS,10 PCT,1/2W | RC20GF561K | AU | 1 |
| R708 | RESISTOR,COMPOSITION,390 OHMS,10 PCT,1/2W | RC20GF391K | AU | 1 |
| R709 AND R710 | SAME AS R101 | | | |
| R711 | SAME AS R205 | | | |
| R712 THRU R716 | SAME AS R101 | | | |
| R717 | SAME AS R708 | | | |
| R718 AND R719 | SAME AS R101 | | | |
| R720 | RESISTOR,COMPOSITION,330 OHMS,10 PCT,1/2W | RC20GF331K | AU | 1 |
| R721 | SAME AS R205 | | | |
| R722 | SAME AS R422 | | | |
| R801 | SAME AS R155 | | | |
| R802 AND R803 | SAME AS R101 | | | |
| R804 | RESISTOR,VARIABLE,COMPOSITION,DUAL SECT,25K, 10 PCT,1/2W,BOTH SECT/POLARAD PART NO. A706986 | KR8822 | DR | 1 |
| R805 AND R806 | SAME AS R101 | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| R807 | NOT USED | | | |
| R808 | SAME AS R701 | | | |
| R809 | SAME AS R202 | | | |
| R810 | SAME AS R101 | | | |
| R811 | NOT USED | | | |
| R812 AND R813 | SAME AS R101•USED ON SERIAL NOS. 595 THRU 634 | | | 1 |
| R812 AND R813 | RESISTOR•COMPOSITION•33 OHMS•5 PCT•1/2W• USED ON SERIAL NOS. 635 AND UP | RC20GF330J | AU | 1 |
| S1 THRU S74 | NOT USED | | | |
| S75 | SWITCH•TOGGLE•DPDT | 8373K8 | CD | 1 |
| S76 | SWITCH•ROTARY•SINGLE POLE•4 POSITIONS /POLARAD PART NO. A137889 | PA-2001 | P | 1 |
| S101 THRU S103 | NOT USED | | | |
| S104 | SWITCH•ROTARY•2 POLES•5 POSITION /POLARAD PART NO. A137213 | MS20-1-6DT | AL | 1 |
| S301 | SWITCH•SENSITIVE•SPDT | AN3234-1 | A | 1 |
| S501 | SWITCH•ROTARY•2 POLES•3 POSITION /POLARAD PART NO. B707026 | PA024-4349 | P | 1 |
| T101 | TRANSFORMER•POWER•KLYSTRON | BP22134 | BE | 1 |
| T102 | TRANSFORMER•POWER | B129121 | BE | 1 |
| T103 | TRANSFORMER•POWER | C144164 | BE | 1 |
| T201 | TRANSFORMER•RF•VARIABLE | A140024 | BE | 1 |
| T202 THRU T218 | NOT USED | | | |
| T219 | TRANSFORMER•RF•USED ON SERIAL NOS. 595 THRU 634 | B127649 | BE | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| T401 | TRANSFORMER,RF | A127657 | BE | 1 |
| T601 AND T602 | NOT USED | | | |
| T603 | TRANSFORMER,POWER,CRT SUPPLY | AP21385 | BE | 1 |
| T801 | TRANSFORMER,RF,VARIABLE | B141447 | BE | 1 |
| T802 | TRANSFORMER,RF,VARIABLE | B142122 | BE | 1 |
| V1 THRU V74 | NOT USED | | | |
| V75 | ELECTRON TUBE,CRT | 5ADP7 | CK | 2 |
| V101 AND V102 | ELECTRON TUBE | 5R4GY | CK | 4 |
| V103 AND V104 | ELECTRON TUBE | 807 | CK | 4 |
| V105 | ELECTRON TUBE | 12AX7 | CK | 8 |
| V106 THRU V110 | ELECTRON TUBE | 0A2 | CK | 10 |
| V111 | ELECTRON TUBE | 6080 | CK | 6 |
| V112 | ELECTRON TUBE | 5881 | CK | 2 |
| V113 AND V114 | SAME AS V111 | | | |
| V115 THRU V117 | SAME AS V105 | | | |
| V118 | ELECTRON TUBE | 5651 | CK | 2 |
| V201 | ELECTRON TUBE | 6AK5 | CK | 4 |
| V202 AND V203 | ELECTRON TUBE | 6BE6 | CK | 4 |
| V204 AND V205 | ELECTRON TUBE | 6AH6 | CK | 8 |
| V301 | ELECTRON TUBE | 5718 | AA | 8 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| V403 | ELECTRON TUBE | 6005 | AU | 2 |
| V401 AND V402 | NOT USED | | | |
| V404 | NOT USED | | | |
| V405 AND V406 | SAME AS V301 | | | |
| V407 | NOT USED | | | |
| V408 | SAME AS V201 | | | |
| V409 | SAME AS V301 | | | |
| V501 | ELECTRON TUBE | 6AS6 | CK | 2 |
| V502 | ELECTRON TUBE | 12AT7 | CK | 4 |
| V503 THRU V505 | ELECTRON TUBE | 12AU7 | CK | 6 |
| V506 AND V507 | ELECTRON TUBE | 6AN8 | CK | 4 |
| V508 AND V509 | SAME AS V204 | | | |
| V601 THRU V615 | NOT USED | | | |
| V616 | ELECTRON TUBE | 6AR6 | CK | 2 |
| V617 AND V618 | ELECTRON TUBE | 1Z2 | CK | 4 |
| V701 THRU V704 | ELECTRON TUBE | 6922 | DN | 8 |
| V801 | SAME AS V502 | | | |
| V802 | ELECTRON TUBE | 6AG5 | CK | 2 |
| W80 | CABLE ASSY | A135336 | BE | 1 |
| W81 THRU W84 | NOT USED | | | |
| W85 | CABLE ASSY | A134776 | BE | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| W86 | CABLE ASSY | A134778 | BE | 1 |
| W87 | CABLE ASSY | A137211 | BE | 1 |
| W88 | CABLE ASSY | A135337 | BE | 1 |
| W89 | CABLE ASSY | A135338 | BE | 1 |
| W90 | CABLE ASSY | A137212 | BE | 1 |
| W91 AND W92 | CABLE ASSY | A141444 | BE | 1 |
| W201 | CABLE ASSY,PART OF P203 | A137228 | BE | 1 |
| W202 | NOT USED | | | |
| W203 | CABLE ASSY | A132283 | BE | 1 |
| W301 | CABLE ASSY | A126279 | BE | 1 |
| W302 | CABLE ASSY | A126278 | BE | 1 |
| W303 | CABLE ASSY | A135347 | BE | 1 |
| W401 | CABLE ASSY | A133099 | BE | 1 |
| W601 | CABLE ASSY. | A134769 | BE | 1 |
| XDS1 THRU XDS75 | NOT USED | | | |
| XDS76 | LAMPHOLDER,BAYONET SOCKET | 101-3830-971 | V | 1 |
| XDS77 THRU XDS80 | LAMPHOLDER,BAYONET SOCKET /POLARAD PART NO. AP17672 | 7-06 | V | 1 |
| XF101 AND XF102 | FUSEHOLDER | 341001 | AP | 1 |
| XF103 AND XF104 | FUSEHOLDER/POLARAD PART NO. B702401 | 357001 | AP | 1 |
| Y201 | CRYSTAL,QUARTZ,29MC,0.005 PCT | CR-23/U-29MC | AU | 1 |
| Y801 AND Y802 | CRYSTAL,QUARTZ,6MC,0.005 PCT | B706956 | BE | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| | SUPPLIED ACCESSORIES | | | |
| A1 | ACCESSORY KIT | A140033 | BE | 1 |
| A2 | WRENCH KIT | A25109 | BE | 1 |
| CP1 | CONNECTOR,ADAPTER,3 CONTACTS WITH GROUNDING WIRE /POLARAD PART NO. A131966 | 228 | FS | 1 |
| MP1 | FILTER,CRT,AMBER | B27336-1 | BE | 1 |
| W1 THRU W70 | NOT USED | | | |
| W71 | CABLE ASSY,POWER ELECTRICAL | B111144 | BE | 1 |
| W71A | CABLE ASSY,PART OF W71 | B145871 | BE | 1 |
| W72 | CABLE ASSY | BP12551 | BE | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| | MODEL STU-1WA TUNING UNIT | | | |
| AT601 | ATTENUATOR,3DB/POLARAD PART NO. AK5530 | HFA-50 | DJ | 1 |
| AT602 | ATTENUATOR ASSY | A26581 | BE | 1 |
| AT603 | ATTENUATOR ASSY,VARIABLE | CP21383 | BE | 1 |
| A501 | NARROW BAND FILTER ASSY | C144772 | BE | 1 |
| A601 | CONNECTOR AND ATTENUATOR ASSY,PART OF AT603 | AP23841 | BE | 1 |
| A602 | PRE-AMPLIFIER ASSY | D144765 | BE | 1 |
| A603 | OSCILLATOR AND ATTENUATOR ASSY | DP21538 | BE | 1 |
| A604 | LOW PASS FILTER ASSY | B24000 | BE | 1 |
| A605 | OSCILLATOR PLATE ASSY | CP22194 | BE | 1 |
| CP601 | ADAPTER,TEE/POLARAD PART NO. AK5528 | UG-28A/U | AU | 1 |
| CP602 | ADAPTER,REDUCING,PART OF W606 | UG-175/U | AU | 1 |
| CP603 | ADAPTER,THREADED,PART OF AT602 | A26648 | BE | 1 |
| CR601 | SEMICONDUCTOR DEVICE,DIODE,MICROWAVE | 1N21C | CJ | 5 |
| CR602 | SEMICONDUCTOR DEVICE,DIODE,ZENER /POLARAD PART NO. A702520 | 1.5M9.1Z-10 | FK | 5 |
| CR603 AND CR604 | NOT USED | | | |
| CR605 AND CR606 | SEMICONDUCTOR DEVICE,DIODE/POLARAD PART NO. B707117/USED ON MODEL STU-1WAF ONLY | CER-71 | GJ | 4 |
| C501 | CAPACITOR,MICA,39UUF,5 PCT,500WVDC | CM15C390J | AU | 1 |
| C502 THRU C505 | CAPACITOR,VARIABLE,CERAMIC,2.0-12UUF,500WVDC /POLARAD PART NO. A701519 | PCST-50 | CH | 1 |
| C601 THRU C603 | NOT USED | | | |
| C604 | CAPACITOR,CERAMIC,68UUF,10 PCT,500WVDC | NPO-301 | Y | 1 |
| C605 | NOT USED | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| C606 | CAPACITOR,CERAMIC,1UUF,10 PCT,500WVDC | GA-1 | CL | 1 |
| C607 | CAPACITOR,MICA,15UUF,10 PCT,500WVDC | M-24 | BL | 1 |
| C608 | CAPACITOR,CERAMIC,FEED-THRU,1000UUF, 20 PCT,500WVDC/POLARAD PART NO. A506409 | 327-102 | Y | 1 |
| C609 | CAPACITOR,MICA,500UUF,10 PCT,500WVDC | 370FC-501K | Y | 1 |
| C610 AND C611 | NOT USED | | | |
| C612 | SAME AS C608 | | | |
| C613 THRU C626 | NOT USED | | | |
| C627 | CAPACITOR,VARIABLE,C/O MP601 AND MP602, NON-REPLACEABLE PART OF A605 | | | |
| C628 THRU C631 | NOT USED | | | |
| C632 AND C633 | CAPACITOR,CERAMIC,25UUF,10 PCT,500WVDC | NP0-308 | Y | 1 |
| C634 | SAME AS C604 | | | |
| C635 AND C636 | NOT USED | | | |
| C637 | CAPACITOR,CERAMIC,1.5UUF,5 PCT,500WVDC | GA-1.5 | CL | 1 |
| C638 THRU C650 | NOT USED | | | |
| C651 | CAPACITOR,CERAMIC,1000UUF,GMV,500WVDC /POLARAD PART NO. B706421 | SB4A-102W | D | 1 |
| C652 | CAPACITOR,CERAMIC,470UUF,10 PCT,1000WVDC /POLARAD PART NO. A702150 | DD-471 | P | 1 |
| C653 THRU C655 | SAME AS C651 | | | |
| C656 | SAME AS C502 | | | |
| C657 | SAME AS C651 | | | |
| C658 | SAME AS C502 | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| C659 THRU C662 | NOT USED | | | |
| C663 AND C664 | SAME AS C502 | | | |
| C665 | CAPACITOR,CERAMIC,10UUF,0.25UUF,TOL,500WVDC | CC20CH100C | AU | 1 |
| C666 AND C667 | SAME AS C502 | | | |
| C668 | SAME AS C665 | | | |
| C669 THRU C672 | NOT USED | | | |
| C673 | SAME AS C502 | | | |
| C674 | SAME AS C652 | | | |
| DS601 AND DS602 | LAMP,INCANDESCENT,6-8V,BAYONET BASE /POLARAD PART NO. 005237 | 47 | CK | 2 |
| FL601 AND FL602 | FILTER,RF,2500UUF,20 PCT,500WVDC /POLARAD PART NO. A700354 | FIB-A | D | 1 |
| FL603 THRU FL651 | NOT USED | | | |
| FL652 | FILTER,RF,LOW PASS,1000UUF,20 PCT,200WVDC /POLARAD PART NO. A701510 | SMFB-2 | D | 1 |
| H601 | KNOB,UNI-DIAL TUNING | A26804 | BE | 1 |
| H602 | KNOB/POLARAD PART NO. A517213 | 225-3-2 | BH | 1 |
| J601 | CONNECTOR,RECEPTACLE,FEMALE,N TYPE, PART OF W601/POLARAD PART NO. AK5401 | MSC2016 | AR | 1 |
| J602 | CONNECTOR,RECEPTACLE,FEMALE,N TYPE /POLARAD PART NO. A109999 | CBYY8263 | DH | 1 |
| J603 | CONNECTOR,RECEPTACLE,FEMALE,BNC TYPE, NON-REPLACEABLE PART OF K602 | | | |
| J604 | CONNECTOR,RECEPTACLE,MALE,18 PINS,WITH HOOD | SA18P-H | CC | 1 |
| J605 | CONNECTOR,RECEPTACLE,BNC TYPE,RT ANGLE | UG-535/U | AU | 1 |
| J606 | CONNECTOR,PLUG,FEMALE,BNC TYPE,PART OF W604 | UG-913/U | AU | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| J607 | NOT USED | | | |
| J608 | CONNECTOR,RECEPTACLE,FEMALE,BNC TYPE | UG-625A/U | AU | 1 |
| J609 | CONNECTOR,RECEPTACLE,FEMALE,UHF TYPE, NON-REPLACEABLE PART OF XCR601 | UG-88C/U | | |
| J610 THRU J612 | NOT USED | | | |
| J613 THRU J615 | CONNECTOR,RECEPTACLE,FEMALE,BNC TYPE, NON-REPLACEABLE PART OF K601 | | | |
| J616 AND J617 | SAME AS J608 | | | |
| J618 AND J619 | SAME AS J603 | | | |
| J620 | NOT USED | | | |
| J621 | CONNECTOR,RECEPTACLE,FEMALE,5 PINS, WITH HOOD/POLARAD PART NO. C509729 | M5S-LRN | CC | 1 |
| J622 | CONNECTOR,RECEPTACLE,FEMALE,BNC TYPE, PART OF A602/POLARAD PART NO. A701331 | UG-290A/U | AU | 1 |
| J623 | CONNECTOR,PLUG,FEMALE,N TYPE,PART OF AT602 /POLARAD PART NO. A26580 | A26580 | BE | 1 |
| J624 | CONNECTOR,PLUG,MALE,N TYPE /POLARAD PART NO. AK5290 | MS2012 | AR | 1 |
| J625 | CONNECTOR,PLUG,FEMALE,N TYPE,PART OF AT602 /POLARAD PART NO. A127603 | UG-21B/U | AU | 1 |
| J626 | CONNECTOR,PLUG,MALE,N TYPE, NON-REPLACEABLE PART OF XCR601 | | | |
| J627 THRU J650 | NOT USED | | | |
| J651 | CONNECTOR,RECEPTACLE,FEMALE,BNC TYPE,RT ANGLE | UG-1098/U | AU | 1 |
| K601 AND K602 | RELAY,ARMATURE,SPDT,115VAC,60CPS /POLARAD PART NO. B137913 | 316-010102-8 | DW | 1 |
| L501 | COIL,RF,0.029UH | B107164 | BE | 1 |
| L502 | COIL,RF,0.147UH | B107466 | BE | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| L503 | COIL,RF,0.09UH | A107159 | BE | 1 |
| L504 | COIL,RF,0.096UH | B107160 | BE | 1 |
| L505 | COIL,RF,0.071UH | A107161 | BE | 1 |
| L506 | COIL,RF,0.146UH | B107162 | BE | 1 |
| L507 | COIL,RF,0.079UH | A107163 | BE | 1 |
| L508 | SAME AS L502 | | | |
| L601 | COIL,RF,NON-REPLACEABLE PART OF W601 | | | |
| L602 | COIL,RF,NON-REPLACEABLE PART OF A601 | | | |
| L603 THRU L605 | NOT USED | | | |
| L606 | COIL,RF | A24132 | BE | 1 |
| L607 | COIL,RF,0.8UH | AP21094 | BE | 1 |
| L608 | COIL,RF,4.5UH | A24893 | BE | 1 |
| L609 THRU L630 | NOT USED | | | |
| L631 AND L632 | COIL,RF,VARIABLE | A24176 | BE | 1 |
| L633 THRU L650 | NOT USED | | | |
| L651 THRU L653 | COIL,RF,4.7UH/POLARAD PART NO. A702559 | 10102-24 | EK | 1 |
| L654 | COIL,RF,VARIABLE | B142203 | BE | 1 |
| L656 | COIL,RF,0.08UH | B107356 | BE | 1 |
| L657 | COIL,RF,0.146UH | A107357 | BE | 1 |
| L658 | COIL,RF | A142519 | BE | 1 |
| L659 | COIL,RF,0.06UH | B107359 | BE | 1 |
| L660 | NOT USED | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| L661 | COIL,RF,0.1345UH | A107360 | BE | 1 |
| L662 THRU L664 | NOT USED | | | |
| L665 | COIL,RF | A142520 | BE | 1 |
| L666 | COIL,RF,0.08UH | B107365 | BE | 1 |
| MP601 | INNER RING,PART OF C627 | AP23930-1 | BE | 1 |
| MP602 | OUTER RING,PART OF C627 | AP23930-2 | BE | 1 |
| P601 | NOT USED | | | |
| P602 | CONNECTOR,PLUG,MALE,N TYPE,PART OF W603 | UG-21B/U | AU | 1 |
| P603 | CONNECTOR,PLUG,MALE,BNC TYPE | UG-88C/U | AU | 1 |
| P604 | CONNECTOR,PLUG,MALE,18 PINS,WITH HOOD /POLARAD PART NO. B537502 | SA18P-H | CC | 1 |
| P605 | CONNECTOR,PLUG,MALE,BNC TYPE, NON-REPLACEABLE PART OF AT601 | | | |
| P606 | CONNECTOR,PLUG,MALE,BNC TYPE, NON-REPLACEABLE PART OF AT601 | | | |
| P607 | SAME AS P603 | | | |
| P608 | CONNECTOR,PLUG,MALE,BNC TYPE | UG-88/U | AU | 1 |
| P609 | CONNECTOR,PLUG,MALE,UHF TYPE /POLARAD PART NO. AK5532 | 83-59 | F | 1 |
| P610 THRU P612 | NOT USED | | | |
| P613 THRU P619 | SAME AS P603 | | | |
| P620 | NOT USED | | | |
| P621 | CONNECTOR,PLUG,MALE,5 PINS,WITH HOOD,H19C /POLARAD PART NO. C509706 | M5P-LS | CC | 1 |
| P622 | SAME AS P608 | | | |
| P623 | SAME AS P602 | | | |

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| P624 THRU P626 | CONNECTOR,PLUG,MALE,N TYPE, NON-REPLACEABLE PART OF CP601 | | | |
| P627 THRU P650 | NOT USED | | | |
| P651 | SAME AS P603 | | | |
| Q601 THRU Q650 | NOT USED | | | |
| Q651 | TRANSISTOR,PNP TYPE /POLARAD PART NO. A702519 | PADT-30 | DN | 1 |
| R601 | RESISTOR,COMPOSITION,47 OHMS,10 PCT,1/2W, PART OF W601 | | | |
| R602 | RESISTOR,COMPOSITION,47 OHMS,10 PCT,1/2W, NON-REPLACEABLE PART OF A601 | | | |
| R603 | RESISTOR,COMPOSITION,18 OHMS,5 PCT,1/2W, NON-REPLACEABLE PART OF AT602 | | | |
| R604 AND R605 | RESISTOR,COMPOSITION,300 OHMS,5 PCT,1/2W, NON-REPLACEABLE PART OF AT602 | | | |
| R606 | RESISTOR,COMPOSITION,22K,10 PCT,2W | RC42GF223K | AU | 1 |
| R607 AND R608 | NOT USED | | | |
| R609 | SAME AS R606 | | | |
| R610 | NOT USED | | | |
| R611 | RESISTOR,COMPOSITION,240 OHMS,5 PCT,1/2W | RC20GF241J | AU | 1 |
| R612 | RESISTOR,COMPOSITION,2.2K,10 PCT,1/2W | RC20GF222K | AU | 1 |
| R613 | RESISTOR COMPOSITION,1.5K,10 PCT,2W | RC42GF152K | AU | 1 |
| R614 THRU R619 | NOT USED | | | |
| R620 | RESISTOR,COMPOSITION,150 OHMS,10 PCT,1/2W | RC20GF151K | AU | 1 |
| R621 THRU R629 | NOT USED | | | |
| R630 | RESISTOR,WW,500 OHMS,5 PCT,5W, USED ON MODEL STU-1WAF ONLY | 57E5015T8 | BN | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| R631 THRU R650 | NOT USED | | | |
| R651 | RESISTOR,COMPOSITION,5.6K,5 PCT,1/4W | RC07GF562J | AU | 1 |
| R652 | RESISTOR,COMPOSITION,3.6K,5 PCT,1/4W | RC07GF362J | AU | 1 |
| R653 | RESISTOR,COMPOSITION,560 OHMS,5 PCT,1/4W | RC07GF561J | AU | 1 |
| R654 | RESISTOR,COMPOSITION,360 OHMS,5 PCT,1/4W | RC07GF361J | AU | 1 |
| R655 THRU R661 | NOT USED | | | |
| R662 | RESISTOR,COMPOSITION,300 OHMS,5 PCT,1/4W | RC07GF301J | AU | 1 |
| R663 | RESISTOR,COMPOSITION,18 OHMS,5 PCT,1/4W | RC07GF180J | AU | 1 |
| R664 | SAME AS R662 | | | |
| R665 THRU R671 | NOT USED | | | |
| R672 | RESISTOR,COMPOSITION,430 OHMS,5 PCT,1/4W | RC07GF431J | AU | 1 |
| R673 | RESISTOR,COMPOSITION,12 OHMS,5 PCT,1/4W | RC07GF120J | AU | 1 |
| R674 | SAME AS R672 | | | |
| R675 | NOT USED | | | |
| R676 | RESISTOR,COMPOSITION,2.2K,10 PCT,1/2W | RC20GF222K | AU | 1 |
| R677 | RESISTOR,COMPOSITION,22 OHMS,5 PCT,1/4W | RC07GF220J | AU | 1 |
| R678 AND R679 | RESISTOR,COMPOSITION,910 OHMS,5 PCT,1/4W | RC07GF911J | AU | 1 |
| S601 | SWITCH,PUSH,DOUBLE POLE /POLARAD PART NO. AP20438 | D8-4 | GB | 1 |
| T601 THRU T651 | NOT USED | | | |
| T652 | TRANSFORMER,POWER | B142517 | BE | 1 |
| V601 | ELECTRON TUBE | 6AF4A | CK | 2 |
| W601 | PROBE AND CABLE ASSY,PART OF AT603 | BP21387 | BE | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| W602 | CABLE ASSY | A27074 | BE | 1 |
| W603 | CABLE ASSY,PATCH | A24845 | BE | 1 |
| W604 | CABLE ASSY | A26610 | BE | 1 |
| W605 | CABLE ASSY | A27075 | BE | 1 |
| W606 | CABLE ASSY | A26609 | BE | 1 |
| W607 | CABLE ASSY | B144586 | BE | 1 |
| W608 | NOT USED | | | |
| W609 | CABLE ASSY | B144592 | BE | 1 |
| W610 | SAME AS W607 | | | |
| W611 | CABLE ASSY | B144587 | BE | 1 |
| W612 | CABLE ASSY | B144588 | BE | 1 |
| W613 | CABLE ASSY | B144589 | BE | 1 |
| XCR601 | HOLDER,CRYSTAL/POLARAD PART NO. A702286 | KN-81-02 | GN | 1 |
| XDS601 AND XDS602 | LAMPHOLDER/POLARAD PART NO. 005246 | 708 | V | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| | MODEL STU-2WA TUNING UNIT | | | |
| A801 | MIXER AND ATTENUATOR ASSY | CP22569 | BE | 1 |
| A802 | CONNECTOR,TEE,N TYPE,PART OF A801 | AP22571 | BE | 1 |
| CP801 | CONNECTOR,TEE,N TYPE | AP22351 | BE | 1 |
| CR801 | SEMICONDUCTOR DEVICE,DIODE,MICROWAVE | 1N23C | CJ | 5 |
| C801 | CAPACITOR PAPER,0.1UF,20 PCT,10000WVDC | CP61B1DG104M | AU | 1 |
| C1501 | CAPACITOR,VARIABLE,CERAMIC,2-12UUF,500WVDC /POLARAD PART NO. A701519 | PCST-50 | CH | 1 |
| C1502 | CAPACITOR,MICA,500UUF,2 PCT,300WVDC /POLARAD PART NO. A702433 | 370FA-501G | Y | 1 |
| DS801 AND DS802 | LAMP,INCANDESCANT,6-8 VOLTS,BAYONET BASE /POLARAD PART NO. 005237 | 47 | CK | 2 |
| H801 | KNOB,UNI-DIAL TUNING | A26804 | BE | 1 |
| H802 | KNOB/POLARAD PART NO. A517213 | 225-3-2 | BH | 1 |
| J801 AND J802 | CONNECTOR,RECEPTACLE,FEMALE,N TYPE /POLARAD PART NO. AK5401 | MSC2016 | AR | 1 |
| J803 | CONNECTOR,RECEPTACLE,MALE,18 PINS /POLARAD PART NO. B537502 | SA18P | CC | 1 |
| J804 | NOT USED | | | |
| J805 | JACK,TIP,BLUE/POLARAD PART NO. A541402 | 110BCS | C | 1 |
| J806 | JACK,TIP,RED/POLARAD PART NO. A541401 | 110BCS | C | 1 |
| J807 THRU J809 | CONNECTOR,RECEPTACLE,FEMALE,N TYPE NON-REPLACEABLE PART OF A802 | | | |
| J1501 | CONNECTOR,RECEPTACLE,FEMALE,N TYPE /POLARAD PART NO. A702498 | 01120 | EA | 1 |
| J1502 | CONNECTOR,RECEPTACLE,FEMALE,BNC TYPE | UG-290/U | AU | 1 |
| L1501 AND L1502 | COIL,RF | A145010 | BE | 1 |
| P801 THRU P806 | NOT USED | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| P807 | CONNECTOR,PLUG,MALE,BNC TYPE | UG-88/U | AU | 1 |
| P808 AND P809 | CONNECTOR,PLUG,FEMALE,N TYPE /POLARAD PART NO. A529000 | MS-2012 | AT | 1 |
| P1501 | NOT USED | | | |
| P1502 | SAME AS P807 | | | |
| R801 | RESISTOR,VARIABLE,COMPOSITION,25K,10 PCT,2W /POLARAD PART NO. 517851 | RV4NAXSD253A | AU | 1 |
| R802 AND R803 | RESISTOR,VARIABLE,COMPOSITION,50K,10 PCT,2W /POLARAD PART NO. 517853 | RV4NAXSD503A | AU | 1 |
| R804 THRU R807 | NOT USED | | | |
| R808 | RESISTOR,COMPOSITION,6.8K,10 PCT,2W | RC42GF682K | AU | 1 |
| R809 | SAME AS R802 | | | |
| R810 | RESISTOR,VARIABLE,COMPOSITION,100K,10 PCT,2W /POLARAD PART NO. 517923 | RV4NAXSD104A | AU | 1 |
| R811 AND R812 | NOT USED | | | |
| R813 | RESISTOR,COMPOSITION,10K,10 PCT,2W | RC42GF103K | AU | 1 |
| R814 | NOT USED | | | |
| R815 | RESISTOR,COMPOSITION,47K,10 PCT,2W | RC42GF473K | AU | 1 |
| R816 THRU R819 | NOT USED | | | |
| R820 | SAME AS R815 | | | |
| R821 | RESISTOR,COMPOSITION,120K,10 PCT,2W | RC42GF124K | AU | 1 |
| R822 | RESISTOR,COMPOSITION,82K,10 PCT,2W | RC42GF823K | AU | 1 |
| R823 | RESISTOR,COMPOSITION,100K,10 PCT,1W | RC32GF104K | AU | 1 |
| R824 | RESISTOR,COMPOSITION,270K,10 PCT,1W | RC32GF274K | AU | 1 |
| R825 | RESISTOR,VARIABLE,WW,100K,5 PCT,12W | BK5413 | BE | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| R826 | RESISTOR,COMPOSITION,8.2K,10 PCT,2W | RC42GF822K | AU | 1 |
| R827 THRU R838 | NOT USED | | | |
| R839 | RESISTOR,FILM,50 OHMS,10 PCT,1/2W<br>NON-REPLACEABLE PART OF W802<br>/POLARAD PART NO. A544104 | | | |
| R840 | RESISTOR,FILM,50 OHMS,10 PCT,1/2W,<br>NON-REPLACEABLE PART OF W804<br>/POLARAD PART NO. A544104 | | | |
| S801 | SWITCH,SENSITIVE,DPST<br>/POLARAD PART NO. AK5412 | BZ3YW22T | AX | 1 |
| V801 | ELECTRON TUBE,KLYSTRON<br>/POLARAD PART NO. AK50046 | 6BM6 OR 5837 | CS | 2 |
| V802 | ELECTRON TUBE | 6X4 | CK | 2 |
| W801 | CABLE ASSY | AP22504-3 | BE | 1 |
| W802 | CABLE AND PROBE ASSY | B22572 | BE | 1 |
| W803 | CABLE ASSY | A144144 | BE | 1 |
| W804 | CABLE AND PROBE ASSY | BP22502 | BE | 1 |
| XCR801 | HOLDER,CRYSTAL | A25270 | BE | 1 |
| XDS801 AND XDS802 | LAMPHOLDER,BAYONET SOCKET<br>/POLARAD PART NO. 005246 | 708 | V | 1 |
| Y801 | OSCILLATOR ASSY LESS V801 | CP20566 | BE | 1 |
| Z1501 | MIXER MATCHING BOX ASSY | C139405 | BE | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| | MODEL STU-3WA TUNING UNIT | | | |
| AT901 | ATTENUATOR ASSY | CP23961 | BE | 1 |
| A901 | MIXER ASSY | D145672 | BE | 1 |
| B901 | BLOWER ASSY,CENTRIFUGAL,115VAC,50-60CPS, USED ON STU-3W ONLY | CP20756 | BE | 1 |
| B901A | MOTOR,BLOWER,CENTRIFUGAL,115VAC,50-60CPS, PART OF B901/POLARAD PART NO. BP21123 | 50745-6E | EV | 1 |
| B901B | FILTER,AIR CONDITIONING,PART OF B901 | BP10517 | BE | 1 |
| B902 | BLOWER ASSY,CENTRIFUGAL,115VAC,50-1000CPS, USED ON STU-3WAF ONLY | C125443 | BE | 1 |
| B902A | MOTOR,BLOWER,CENTRIFUGAL,115VAC,50-1000CPS, PART OF B902 | B124348 | BE | 1 |
| B902B | FILTER,AIR CONDITIONING,PART OF B902 | A129399 | BE | 1 |
| CP901 | ADAPTER ASSY,N TYPE | C119529 | BE | 1 |
| CP902 | ADAPTER ASSY | C20947 | BE | 1 |
| CP903 | ADAPTER ASSY | BP24550 | BE | 1 |
| CP904 | ADAPTER,CONNECTOR,PART OF W906 | BP24029 | BE | 1 |
| CR901 | SEMICONDUCTOR DEVICE,DIODE,MICROWAVE | 1N78 | CJ | 5 |
| C901 | CAPACITOR,PAPER,0.1UF,20 PCT,1000WVDC | CP61B1DG104M | AU | 1 |
| C1002 | CAPACITOR,PAPER,0.5UF,10PCT,600WVDC, PART OF B902 | CP54B1EF504K | AU | 1 |
| DS901 AND DS902 | LAMP,INCANDESCANT,6-8V,BAYONET BASE /POLARAD PART NO. 005237 | 47 | CK | 2 |
| H901 | KNOB, UNI-DIAL TUNING | A26804 | BE | 1 |
| H902 | KNOB/POLARAD PART NO. AP22082 | 125-2-2 | H | 1 |
| J901 AND J902 | CONNECTOR,RECEPTACLE,FEMALE,N TYPE /POLARAD PART NO. AK5401 | MSC2016 | AR | 1 |
| J904 | CONNECTOR,PLUG,MALE,18 PINS /POLARAD PART NO. B537502 | SA18P | CC | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| J905 | JACK,TIP,BLUE/POLARAD PART NO. A541402 | 110BCS | C | 1 |
| J906 | JACK,TIP,RED/POLARAD PART NO. A541401 | 110BCS | C | 1 |
| J907 | CONNECTOR ASSY,PART OF AT901 | AP23978 | BE | 1 |
| P901 AND P902 | CONNECTOR,PLUG,MALE,N TYPE | UG-21B/U | AU | 1 |
| P903 | CONNECTOR,PLUG,MALE,BNC TYPE | UG-88/U | AU | 1 |
| P904 THRU P906 | NOT USED | | | |
| P907 | CONNECTOR,PLUG,MALE,N TYPE /POLARAD PART NO. A529000 | MS2012 | AR | 1 |
| P1501 | NOT USED | | | |
| R901 | RESISTOR,FILM,MICROWAVE,50 OHMS,10 PCT,1/2W, NON-REPLACEABLE PART OF W904 /POLARAD PART NO. A544104 | | | |
| R902 | RESISTOR,VARIABLE,COMPOSITION,25K,10 PCT,2W /POLARAD PART NO. 517851 | RV4NAXSD253A | AU | 1 |
| R903 AND R904 | RESISTOR,COMPOSITION,10K,10 PCT,1W /POLARAD PART NO. 519219 | RC32GF103K | AU | 1 |
| R905 | RESISTOR,VARIABLE,COMPOSITION,50K,10 PCT,2W /POLARAD PART NO. 517853 | RV4NAXSD503A | AU | 1 |
| R906 | RESISTOR,FILM,MICROWAVE,50 OHMS,10 PCT,1/2W, NON-REPLACEABLE PART OF W905 /POLARAD PART NO. A544104 | | | |
| R907 THRU R914 | NOT USED | | | |
| R915 | SAME AS R905 | | | |
| R916 | SAME AS R902 | | | |
| R917 | RESISTOR,COMPOSITION,47K,10 PCT,2W /POLARAD PART NO. 518623 | RC42GF473K | AU | 1 |
| R918 | NOT USED | | | |
| R919 | SAME AS R905 | | | |
| R920 | RESISTOR,VARIABLE,WW,100K,1 PCT,12W, TAP A,80K,TAP B,60K,TAP C,40K,TAP D,20K /POLARAD PART NO. 005033 | RVLL-3-12-S73 | DL | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| R921 | RESISTOR,COMPOSITION,270K,10 PCT,1W | RC32GF274K | AU | 1 |
| R922 | RESISTOR,COMPOSITION,100K,10 PCT,1W /POLARAD PART NO. 519225 | RC32GF104K | AU | 1 |
| S901 | SWITCH,SENSITIVE,DPST,115 VAC /POLARAD PART NO. AK5412 | BZ3YW22T | AM | 1 |
| V901 | ELECTRON TUBE,KLYSTRON /POLARAD PART NO. BK5014 | 5721 | BH | 2 |
| V902 | ELECTRON TUBE | 6X4 | CK | 2 |
| W901 | NOT USED | | | |
| W902 | CABLE ASSY | AP22504-2 | BE | 1 |
| W903 | CABLE ASSY,PATCH | A24845 | BE | 1 |
| W904 | CABLE AND PROBE ASSY,PART OF A901 | BP22631 | BE | 1 |
| W905 | CABLE AND PROBE ASSY,PART OF AT901 | BP21084 | BE | 1 |
| W906 | CABLE ASSY,RF,PART OF A901 | B145673 | BE | 1 |
| XDS901 AND XDS902 | LAMPHOLDER,BAYONET SOCKET /POLARAD PART NO. 005246 | 708 | V | 1 |
| Y901 | OSCILLATOR ASSY,LESS V901 | CP20512 | BE | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| | MODEL STU-4WA TUNING UNIT | | | |
| A1001 | FREQUENCY CONVERTER ASSY | D145675 | BE | 1 |
| A1002 | MIXER ASSY | C145677 | BE | 1 |
| B1001 | BLOWER ASSY,CENTRUFUGAL,115VAC,50-60CPS | CP20756 | BE | 1 |
| B1001A | MOTOR,BLOWER,SYNCHRONOUS,115VAC,50-60CPS, PART OF B1001/POLARAD PART NO. BP21123 | 50745-6E | EV | 1 |
| B1001B | FILTER,AIR CONDITIONING,PART OF B1001 /POLARAD PART NO. BP10517 | BP10517 | BE | 1 |
| B1002 | BLOWER ASSY,CENTRIFUGAL,115VAC,50-1000CPS, USED ON STU-4WAF ONLY | C125443 | BE | 1 |
| B1002A | MOTOR,BLOWER,CENTRIFUGAL,115VAC,50-1000CPS, PART OF B1002 | B124348 | BE | 1 |
| B1002B | FILTER,AIR CONDITIONING,PART OF B1002 | A129399 | BE | 1 |
| CP1001 | CONNECTOR,ADAPTER ASSY | B146205 | BE | 1 |
| CR1001 | SEMICONDUCTOR DEVICE,DIODE,SILICON | 1N26 | CK | 5 |
| C1001 | CAPACITOR,PAPER,0.1UF,20 PCT,1000WVDC | CP61B1DG104M | AU | 1 |
| C1002 | CAPACITOR,PAPER,0.5UF,10 PCT,600WVDC, PART OF B1002 | CP54B1EF504K | AU | 1 |
| DS1001 AND DS1002 | LAMP,INCANDESCENT,6-8V,BAYONET BASE /POLARAD PART NO. 005237 | 47 | CK | 2 |
| H1001 | KNOB,UNI-DIAL TUNING | A26804 | BE | 1 |
| J1001 THRU J1003 | NOT USED | | | |
| J1004 | CONNECTOR,RECEPTACLE,MALE,18 PINS, /POLARAD PART NO. 516013 | SA18P | CC | 1 |
| J1005 | JACK,TIP,BLUE/POLARAD PART NO. A541402 | 110BCS | C | 1 |
| J1006 | JACK,TIP,RED/POLARAD PART NO. A541401 | 110BCS | C | 1 |
| MP1001 | KLYSTRON COVER AND SOCKET | BK50148 | BE | 1 |
| P1001 AND P1002 | NOT USED | | | |

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| P1003 | CONNECTOR,PLUG,MALE,BNC TYPE | UG-88/U | AU | 1 |
| R1001 | RESISTOR,FILM,MICROWAVE,50 OHMS,10 PCT,1/2W, NON-REPLACEABLE PART OF W1001 /POLARAD PART NO. A544104 | | | |
| R1002 | RESISTOR,VARIABLE,COMPOSITION,25K,10 PCT,2W /POLARAD PART NO. 517851 | RV4NAXSD253A | AU | 1 |
| R1003 AND R1004 | RESISTOR,COMPOSITION,10K,10 PCT,1W | RC32GF103K | AU | 1 |
| R1005 | RESISTOR,VARIABLE,COMPOSITION,100K,10 PCT,2W /POLARAD PART NO. 517923 | RV4NAXSD104A | AU | 1 |
| R1006 THRU R1014 | NOT USED | | | |
| R1015 | SAME AS R1005 | | | |
| R1016 | RESISTOR,VARIABLE,COMPOSITION,250K,10 PCT,2W /POLARAD PART NO. 517925 | RV4NAXSD254A | AU | 1 |
| R1017 | RESISTOR,COMPOSITION,47K,10 PCT,2W | RC42GF473K | AU | 1 |
| R1018 | NOT USED | | | |
| R1019 | SAME AS R1005 | | | |
| R1020 | RESISTOR,VARIABLE,WW,100K,1 PCT,12W, TAP A,80K,TAP B,60K,TAP C,40K,TAP D,20K /POLARAD PART NO. 005033 | RVLL-3-12-S73 | DL | 1 |
| R1021 | RESISTOR,COMPOSITION,270K,10 PCT,1W | RC32GF274K | AU | 1 |
| R1022 | RESISTOR,COMPOSITION,100K,10 PCT,1W | RC32GF104K | AU | 1 |
| S1001 | SWITCH,SENSITIVE,SPDT/POLARAD PART NO. AK5412 | BZ3YW22T | AX | 1 |
| TB1001 | TERMINAL BOARD ASSY | CP23615 | BE | 1 |
| V1001 | ELECTRON TUBE,KLYSTRON /POLARAD PART NO. BK5014 | 5721 | BH | 1 |
| V1002 | ELECTRON TUBE | 6X4 | CK | 1 |
| W1001 | PROBE AND CABLE ASSY,PART OF A1002 | BP15655 | BE | 1 |
| W1002 | WAVEGUIDE ADAPTER ASSY | BP22330 | BE | 1 |
| W1003 | WAVEGUIDE ADAPTER ASSY | BP22331 | BE | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| W1004 | CABLE ASSY | B145678 | BE | 1 |
| XDS1001 AND XDS1002 | LAMPHOLDER.BAYONET SOCKET /POLARAD PART NO. 005246 | 7-08 | V | 1 |
| Y1001 | OSCILLATOR ASSY LESS V1001 | CP20512 | BE | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| | MODEL STU-5WA TUNING UNIT | | | |
| A1101 | FREQUENCY CONVERTER ASSY | D146347 | BE | 1 |
| A1102 | MIXER ASSY | C146349 | BE | 1 |
| B1101 | BLOWER ASSY,CENTRIFUGAL,115VAC,50-60CPS | CP20756 | BE | 1 |
| B1101A | MOTOR,BLOWER,CENTRIFUGAL,115VAC,50-60CPS, PART OF B1101/POLARAD PART NO. BP21123 | 50745-6E | EV | 1 |
| B1101B | FILTER AIR CONDITIONING,PART OF B1101 | BP10517 | BE | 1 |
| B1102 | BLOWER ASSY,CENTRIFUGAL,115VAC,50-1000CPS, USED ON STU-5WAF ONLY | C125443 | BE | 1 |
| B1102A | MOTOR,BLOWER,CENTRIFUGAL,115VAC,50-1000CPS, PART OF B1102 | B124348 | BE | 1 |
| B1102B | FILTER,AIR CONDITIONING,PART OF B1102 | A129399 | BE | 1 |
| CP1101 | CONNECTOR,ADAPTER ASSY | B146206 | BE | 1 |
| CR1101 | SEMICONDUCTOR DEVICE,DIODE,MICROWAVE | 1N53 | CJ | 5 |
| C1101 | CAPACITOR,PAPER,0.1UF,20 PCT,1000WVDC | CP61B1DG104M | AU | 1 |
| C1102 | CAPACITOR,PAPER,0.5UF,10 PCT,600WVDC, PART OF B1102 | CP54B1EF504K | AU | 1 |
| DS1101 AND DS1102 | LAMP,INCANDESCENT,6-8V,BAYONET BASE /POLARAD PART NO. 005237 | 47 | CK | 2 |
| H1101 | KNOB,UNI-DIAL TUNING | A26804 | BE | 1 |
| J1101 THRU J1103 | NOT USED | | | |
| J1104 | CONNECTOR,RECEPTACLE,MALE,18 PINS /POLARAD PART NO. 516013 | SA18P | CC | 1 |
| J1105 | JACK,TIP,BLUE/POLARAD PART NO. A541402 | 110BCS | C | 1 |
| J1106 | JACK,TIP,RED/POLARAD PART NO. A541402 | 110BCS | C | 1 |
| MP1101 | KLYSTRON COVER AND SOCKET | BK50148 | BE | |
| P1101 AND P1102 | NOT USED | | | |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| P1103 | CONNECTOR,PLUG,MALE,BNC TYPE | UG-88/U | AU | 1 |
| R1101 | RESISTOR,MICROWAVE,50 OHMS,10 PCT,1/2W<br>NON-REPLACEABLE PART OF W1101<br>/POLARAD PART NO. A544104 | | | |
| R1102 | RESISTOR,VARIABLE,COMPOSITION,25K,10 PCT,2W<br>/POLARAD PART NO. 517851 | RV4NAXSD253A | AU | 1 |
| R1103 AND R1104 | RESISTOR,COMPOSITION,10K,10 PCT,1W | RC32GF103K | AU | 1 |
| R1105 | RESISTOR,VARIABLE,COMPOSITION,100K,10 PCT,2W<br>/POLARAD PART NO. 517923 | RV4NAXSD104A | AU | 1 |
| R1106 THRU R1114 | NOT USED | | | |
| R1115 | RESISTOR,COMPOSITION,18K,10 PCT,1W | RC32GF183K | AU | 1 |
| R1116 | NOT USED | | | |
| R1117 | RESISTOR,COMPOSITION,82K,10 PCT,2W | RC42GF823K | AU | 1 |
| R1118 | NOT USED | | | |
| R1119 | SAME AS R1105 | | | |
| R1120 | RESISTOR,VARIABLE,WW,100K,5 PCT,12W | BK5413 | BE | 1 |
| R1121 | RESISTOR,COMPOSITION,270K,10 PCT,1W | RC32GF274K | AU | 1 |
| R1122 | NOT USED | | | |
| R1123 | RESISTOR,COMPOSITION,100K,10 PCT,1W | RC32GF104K | AU | 1 |
| TB1101 | TERMINAL BOARD ASSY | CP23611 | BE | 1 |
| V1101 | ELECTRON TUBE,KLYSTRON<br>/POLARAD PART NO. BK5014 | 5721 | BH | 2 |
| V1102 | ELECTRON TUBE | 6X4 | CK | 2 |
| W1101 | PROBE AND CABLE ASSY,PART OF A1102 | B15655 | BE | 1 |
| W1102 | WAVEGUIDE ADAPTER ASSY | B146207 | BE | 1 |
| W1103 | CABLE ASSY | B146350 | BE | 1 |

TABLE 6-2. PARTS LIST (CON'T)

| REF SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR'S CODE | MAINT QTY |
|---|---|---|---|---|
| W1104 | WAVEGUIDE ADAPTER ASSY | B146208 | BE | 1 |
| XDS1101 AND XDS1102 | LAMPHOLDER,BAYONET SOCKET /POLARAD PART NO. 005246 | 7-08 | V | 1 |
| Y1101 | OSCILLATOR ASSY,LESS V1101 | CP20512 | BE | 1 |

POLARAD

**POLARAD ELECTRONIC INSTRUMENTS**

A DIVISION OF POLARAD ELECTRONICS CORPORATION

34-02 QUEENS BOULEVARD · LONG ISLAND CITY 1, N.Y. · AREA CODE 212 · EXETER 2-4500

# REQUEST FOR MAINTENANCE

FROM:

COMPANY NAME _____ DATE: _____

ADDRESS: _____ INDIVIDUAL _____

_____ POSITION _____

SECTION OR DIVISION _____ PHONE NO. _____ EXT. _____

_____

EQUIPMENT _____ DATE OF PURCHASE _____

MODEL _____ SERIAL NO. _____ ORDER NO. _____

_____

TROUBLE REPORT:

A. Description of trouble _____

_____

_____

_____

_____

_____

B. Has trouble been localized? _____ If so, how and where: _____

_____

_____

_____

_____

_____

C. Instruments used and measurements taken, if any: _____

_____

_____

_____

D. Is trouble intermittent? _____

E. Hours of operation prior to this trouble _____

F. Date trouble occurred _____

G. Was factory consulted by telephone or letter prior to this request? _____

If so, give date and person to whom directed: _____

_____

H. Additional Comments: _____

_____

_____

_____

_____

_____

_____

When trouble develops requiring factory assistance, complete this form and send to:

Polarad Electronic Instruments
Division of
Polarad Electronics Corporation
34-02 Queens Boulevard
Long Island City 1, New York
ATTENTION: Service Department

After this report has been analyzed by the Service Department, you will be notified when a field service engineer will call on you to make the necessary repairs. If your trouble can best be corrected at the factory, we will so notify you with instructions and authorization for returning the equipment.

NO EQUIPMENT MAY BE RETURNED TO THE FACTORY WITHOUT WRITTEN AUTHORIZATION

# *Microwave Electronic Instruments*

POLARAD

# POLARAD


Spectrum Analyzers 10 — 100,000 mc . . . . . 2 — 3
Spectrum Signature Monitors 400 — 84,200 mc . . . . . 4
Microwave Receivers 400 — 84,200 mc . . . . . 4 — 5
RI/FI Meters 1,000 — 21,000 mc; Antennas . . . . . 4 — 5
Signal Generators & Signal Sources 500 — 50,000 mc . . . . . 6
Modular Microwave Signal Generator Equipment . . . . . 7
Pulse, Impulse, and Noise Generators; Infrared; Related Instrumentation . . . . . 7
Industry Services . . . . . 8


POLARAD ELECTRONIC INSTRUMENTS A Division of Polarad Electronics Corp. 34-02 Queens Blvd., Long Island City 1, New York
World Leader in Microwave Instrumentation

# POLARAD SPECTRUM ANALYZERS PROVIDE PRECIS

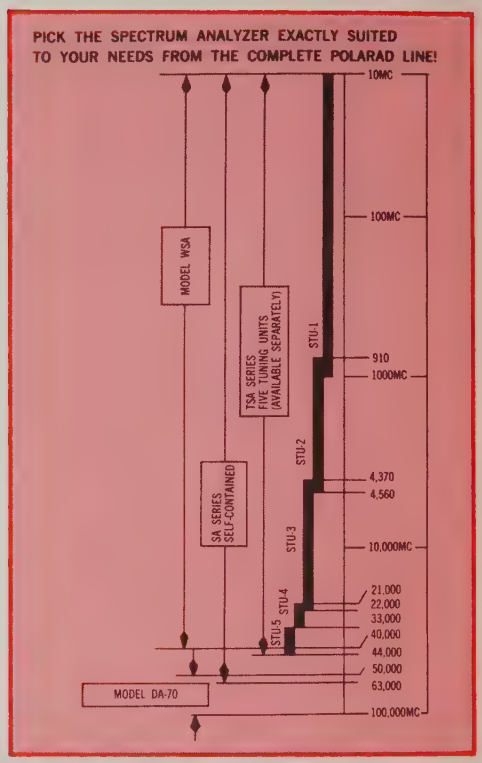
Polarad pioneered the modern microwave spectrum analyzer. Today, this diversified line of instruments provides the designer or test engineer with the most precise and meaningful quantitative and qualitative information about any signal, regardless of complexity or frequency content, up to 100 KMC.

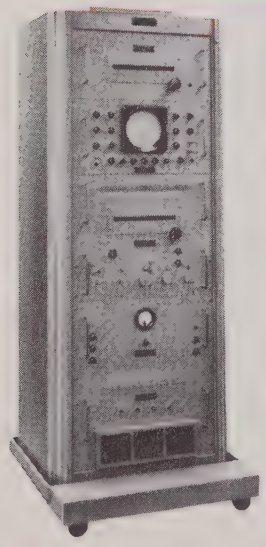
The unequalled dependability, accuracy, and operational convenience provided by these instruments reflect the experience and design ability that have made Polarad the undisputed leader in this demanding form of the microwave instrumentation art.

The features listed below are, in general, common to all Polarad Spectrum Analyzers.

- **Direct-reading UNIDIAL® tuning — no klystron mode-setting!**
- **Frequency Dial Accuracy, ±1%**
- **Sweep-rate adjustable, 1-30 cps**
- **High Sensitivity**
- **Variable resolution for optimum analysis.**
- **Non-contacting klystron-cavity chokes fror noiseless tuning, optimum stability**
- **Five-inch flat-face CRT display**
- **Compatible with Multi-pulse Spectrum Selector SD-1**
- **Low residual FM**

The chart to the right permits rapid selection of the spectrum analyzer best suited to your problem. Note that by taking advantage of the plug-in range selection of the TSA series, you need only purchase the range you need, yet you automatically provide for extending the range later by obtaining additional tuning units as required!



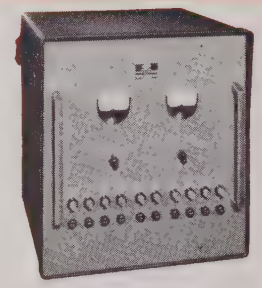
*Model WSA*

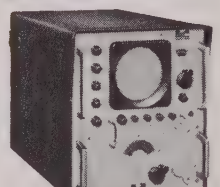
## WIDE BAND SPECTRUM ANALYZER 10 - 40,000 MC

**Model WSA** is a unique universal instrument providing the ultimate in convenience and application flexibility.

**Features:** rapid range selection by 20 illuminated push-buttons; wide band display—up to 4,000 MC—simplifying field-intensity measurements; end-markers, indicating band limits; frequency marker to 4KMC; Narrow mode: 1-25MC dispersion, 20KC resolution; Wide mode: 50-4,000 MC dispersion, 1.5MC resolution; center marker for wide-to-narrow band switching without loss of signal.

| Frequency Range | Nominal Sensitivity |
|---|---|
| 10 mc to 410 mc | —80 dbm |
| 410 mc to 12.4 kmc | —70 dbm |
| 12.4 kmc to 18.5 kmc | —60 dbm |
| 18.5 kmc to 26.0 kmc | —50 dbm |
| 26.0 kmc to 40.0 kmc | —50 dbm |

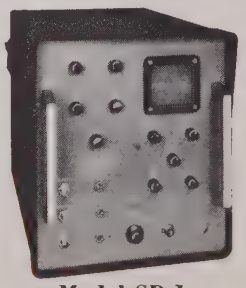




*Model DA-70*

## EHF SPECTRUM ANALYZER

**Model DA-70** covers the important range from 50-100 KMC, using a single accurately-calibrated (±1%) tuning unit with exclusive UNIDIAL® convenience. Dispersion is continuously adjustable from 50-1,000MC; Resolution is 1MC. Markers are provided for spectrum calibration to ±5%. High-frequency IF stages insure excellent image rejection, prevent video detection. Sensitivity, —50 dbm, nominal.



*Model SD-1*

## MULTIPULSE SPECTRUM SELECTOR Model SD-1

When used in conjunction with any Polarad spectrum analyzer, this unique instrument permits spectrum analysis of any one selected pulse within a multiple pulse train. Particularly useful in design and analysis of telemetry, IFF, beacons, and radars.

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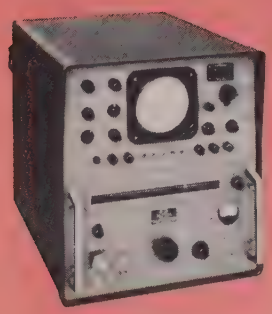
# /ISUAL MICROWAVE ANALYSIS – 10 to 100,000 MC

POLARAD

## SA SERIES

Universal Spectrum Analyzers represent the most advanced designs in the current state of the art. Completely self-contained, with every important marker, control, and calibration facility normally required in spectrum analysis, they cover their entire frequency range without plug-ins or accessories. In particular the new Model SA-84WA provides the widest frequency range ever offered in a universal instrument: 10 MC to 63,680 MC! Also of special interest is the new portable, compact transistorized Model SA-84T . . . 40% lighter, with improved performance.



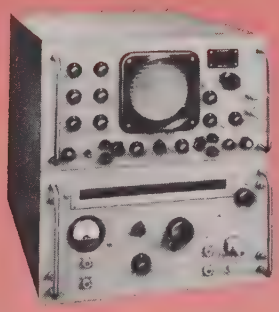
*Model SA-84W/WA*

***Sensitivity to −115 dbm***

Wide-Dispersion Universal Design. **Features:** excellent sensitivity; wide-range variable dispersion; wide-range variable resolution; crystal-controlled markers over entire frequency range; log-linear display; accurate IF attenuator.

| Model | Frequency | Dispersion | Resolution |
|---|---|---|---|
| SA-84WA | 10-63,680MC | 25KC-80MC (Available to 100MC) | 1KC-80KC |
| SA-84W | 10-40,880MC | 25KC-80MC* | 1KC-80KC |

*25KC-10MC below 240MC.



*Model SA-84*

Standard Universal design, 10-40,880 MC. **Features:** excellent sensitivity (—40 to —90 dbm, depending on frequency); Variable internal marker, graduations every 200 KC; 25 KC resolution; dispersion adjustable 500 KC — 25 MC (500 KC — 5 MC up to 55 MC). The most economical universal instrument in its class!

*Model SA-84T*

Portable Transistorized Universal design, 10-40,880 MC. **Features:** excellent sensitivity (—55 to —105 dbm, depending on frequency); ±13 MC internal marker tuning range; 20 KC resolution; dispersion adjustable 500 KC — 25 MC. Operates from 12 volt battery or line power. Truly portable!

## TSA SERIES

Spectrum Analyzers can all cover 10-44,000 MC, the actual range being determined by the number of interchangeable plug-in tuning heads purchased. Thus, the engineer may select only the ranges of interest, yet provide for full coverage at some later date, reducing his initial investment.

The basic TSA design is available in three forms: with a conventional variable dispersion, with a wider range of dispersion, and with a built-in synchroscope mode.

| TSA/TSA-S | TSA-W | Equipment | Frequency Range | Sensitivity: (minimum discernible signal) |
|---|---|---|---|---|
| STU-1B | STU-1BW | R-F Tuning Unit | 10 to 1,000 mc | 10 to 400 mcs —90 to —105dbm<br>350 to 1,000 mcs —88 to — 95dbm |
| STU-2B | STU-2BW | R-F Tuning Unit | 910 to 4,560 mc | 910 to 2,200 mcs —100to —115dbm<br>1,980 to 4,560 mcs —100to —110dbm |
| STU-3B | STU-3BW | R-F Tuning Unit | 4,370 to 22,000 mc | 4,370 to 11,000 mcs —77 to —90 dbm<br>8,900 to 22,000 mcs —65 to —85 dbm |
| STU-4B | STU-4BW | R-F Tuning Unit | 21,000 to 33,000 mc | 21,000 to 33,000 mcs —57 to —75 dbm |
| STU-5B | STU-5BW | R-F Tuning Unit | 33,000 to 44,000 mc | 33,000 to 44,000 mcs —50 to —65 dbm |

| OPTIONS | UNIT |
|---|---|
| 1. 100 mc Dispersion | 1. TSA-W, SA-84W, SA-84WA |
| 2. Phase Lock Capability | 2. All Units |
| 3. AM Marker Modulation Input | 3. All Units |
| 4. XY Recorder Output & Slow Scan Rate | 4. TSA, TSA-W, SA-84W, SA-84WA |
| 5. 50 DB on Screen Log Display | 5. TSA, TSA-W, SA-84W, SA-84WA |
| 6. 63 DB Calibrated IF Attenuator | 6. SA-84T |
| 7. Choice of CRT Phosphor | 7. All Units |

*Model TSA*

Provides power vs. frequency display. **Features:** adjustable dispersion, 100 KC — 25 MC; variable resolution, 1-80 KC; ±14 MC marker tuning range; excellent sensitivity (—50 to —115 dbm, depending on frequency); log-amplitude display for wide dynamic range.

*Model TSA-W*

Provides widest range of dispersions. Shown above are two displays representing extremes of adjustable dispersion range (25 KC — 80 MC). Resolution variable, 1 — 80 KC. ±40 MC marker tuning range. Excellent sensitivity (—50 to —115 dbm, depending on frequency). This instrument will display the spectrum of a 0.1 μsec. pulse!

*Model TSA-S*

Combines high-performance Synchroscope display (shown above left) with conventional power-vs.-frequency display. Synchroscope sweep rates adjustable from 2μsec/trace to 0.1 sec/trace. Dispersion adjustable, 400 KC —25 MC. Resolution 5/50/500 KC and 5 MC. Marker tuning range, ±14 MC. An excellent dual-purpose research instrument!

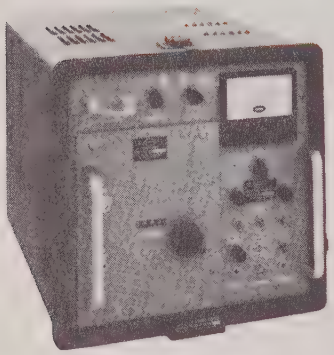
# POLARAD MICROWAVE RECEIVERS (400-84,200 MC)

Polarad developed many of the fundamental circuit concepts upon which most of the calibrated microwave receivers and field-intensity meters in current use are based. The four instrumentation systems described on these 2 pages represent the highest achievements in the current state of the art.

Among the outstanding features of these instruments are the following:

- Direct-reading ±1% frequency calibration, with digital display and/or UNIDIAL® tuning.
- Complete flexibility of signal reception: AM, FM, CW, Pulse.
- Direct and absolute signal-level calibration — with internal calibrating generators in the RI/FI meters.
- Complete range of compatible calibrated and uncalibrated antennas with exceptional directivity and low VSWR.

## TRANSISTORIZED MICROWAVE RECEIVER



0.95-21 KMC. **Portable, compact, rugged.** Four instruments in one: AM, FM, CW, MCW, Receiver; Pulse Receiver; Field-Intensity Receiver, and sensitive Power Meter.

*Model TR*

- AFC, AGC circuits.
- Digital frequency dial.
- 60 db linearity range!
- Impulse Bandwidth: 1 MC, 5 MC, or wideband.
- Output calibrated directly in db.
- Preselection on all tuning units.
- Video Bandwidth, 4 MC.
- Sensitivity: —77 dbm minimum.
- Choice of 12V battery or line power.
- Audio, video, recorder outputs.

| Six Interchangeable Plug-In Tuning Units | | |
|---|---|---|
| Tuning Unit No. | Frequency Range | Minimum Sensitivity |
| T-RL | 950 — 2,040 mc | — 90 dbm |
| T-RS | 1,900 — 4,340 mc | — 90 dbm |
| T-RM | 4,200 — 7,740 mc | — 87 dbm |
| T-RX | 7,300 — 11,260 mc | — 87 dbm |
| T-RKS | 9,850 — 15,350 mc | — 80 dbm |
| T-RKU | 14,800 — 21,000 mc | —77 dbm |

## MICROWAVE TEST ANTENNAS

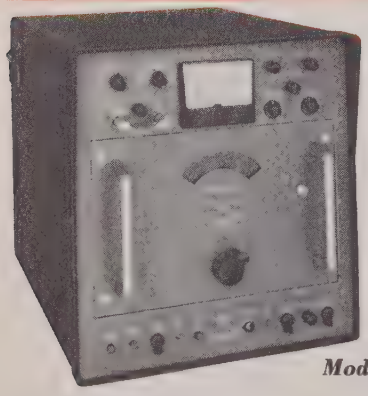
Calibrated (MIL-I-26600 approved) and uncalibrated types. Highly directional, linearly polarized, high front/back ratio, max VSWR of 3:1. Lightweight, portable, rugged construction.

| CALIBRATED TEST ANTENNAS | | TEST ANTENNAS | |
|---|---|---|---|
| Model | Frequency Range | Model | Frequency Range |
| CA-B | 1,000 to 10,000 MC | UH1 | 400 to 1,000 MC |
| CA-L | 1,000 to 2,340 MC | L | 1,000 to 2,300 MC |
| CA-S | 2,140 to 4,340 MC | S | 2,150 to 4,600 MC |
| CA-M | 4,190 to 7,740 MC | M | 4,450 to 8,000 MC |
| CA-X | 7,360 to 10,000 MC | X | 7,850 to 12,400 MC |
| CA-KS | 9,800 to 15,350 MC | Ku | 12,400 to 18,000 MC |
| CA-KU | 14,750 to 21,000 MC | K | 18,000 to 26,500 MC |
| CA-KSO | 9,850 to 15,350 MC | Ka | 26,500 to 40,000 MC |
| CA-KUO | 14,750 to 21,000 MC | | |
| CA-T | Tripod | | |

## SPECTRUM SIGNATURE MONITOR MODEL DM-1

**Converts your Receiver or RI/FI Meter for Visual Display of Signal Power vs Frequency**

Model DM-1 utilizes 140-megacycle IF output of receiver or meter to provide linear or logarithmic display of signal amplitude versus frequency-components, on 5-inch CRT. Variable resolution 1-80 KC, adjustable dispersion 150 KC-25MC, attenuation from 0-40 db, and calibrated marker pips variable ±14 MC, permit meaningful signal analysis over the receiver's frequency range. An efficient, economical way to add a Spectrum Analyzer to your lab or field instrumentation!



## ULTRA-WIDE-BAND MICROWAVE RECEIVER

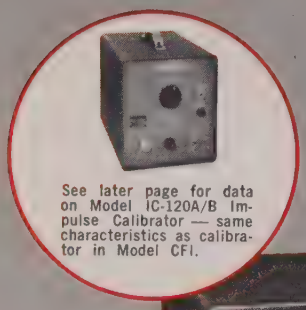
0.4-84.2 KMC! Choose only the tuning ranges you require, yet provide for full coverage later — thus effecting significant saving in initial investment! Four instruments in one: AM, FM, CW, MCW, Receiver; Pulse Receiver; Field Intensity Receiver, sensitive Power Meter.

*Model R*

- AFC, AGC circuits.
- Direct-reading UNIDIAL®.
- 60 db linearity range!
- Image and Spurious Response rejection better than 60 db up to 11.26 KMC.
- Video Bandwidth, 2 MC.
- Sensitivity: —85 to — 55 dbm (minimum), depending on frequency range.
- Output calibrated directly in db.
- Audio, video, recorder outputs.

| Ten Interchangeable Plug-In Tuning Units: | | |
|---|---|---|
| Tuning Unit | Frequency Range | Minimum Sensitivity |
| Model RR-T | 395 to 1,050 mc | —85 dbm |
| Model RL-T | 950 to 2,040 mc | —80 dbm |
| Model RS-T | 1,900 to 4,340 mc | —80 dbm |
| Model RM-T | 4,200 to 7,740 mc | —80 dbm |
| Model RX-T | 7,300 to 11,260 mc | —80 dbm |
| Model RKS-T | 9,500 to 15,600 mc | —65 dbm |
| Model RKU-T | 14,700 to 22,000 mc | —65 dbm |
| Model RQ-T | 20,260 to 31,260 mc | —65 dbm |
| | 30,260 to 46,700 mc | —55 dbm |
| Model RE-T | 45,300 to 84,200 mc | —55 dbm |
| Model RW-T* | 2,000 to 75,000 mc | —70 to —85 dbm |

*Antenna Pattern Tuning Unit. External mixer with flexible cable. Locate up to 75 ft. from receiver, at or near antenna.



See later page for data on Model IC-120A/B Impulse Calibrator — same characteristics as calibrator in Model CFI.

## TRANSISTORIZED CALIBRATED FIELD-INTENSITY (RI/FI) METER — 1,000 to 15,000 MC.

*USAF approved RI/FI measurements to 10KMC per Category A of MIL-I-26600 and MIL-I-6181!*

**Transistorized, portable, compact, ruggedized.**

Combines an impulse calibrator, field-intensity meter, and calibrated antenna system. Provides accurate measurements of frequency and absolute power level of conducted or radiated microwave energy. Choice of 12V battery or line-power operation.

**Features:** UNIDIAL® tuning; Direct-reading **digital** frequency dial; ±1% frequency accuracy; Choice of 3 impulse bandwidths — 1/5/wideband MC; output level direct-reading in db; Image and spurious response rejection better than 60 db; Max. RF input, 3 volts. Audio, video, recorder outputs. AM, FM, CW, and Pulse reception.

*Model CFI*

| Five Interchangeable Plug-In Tuning Units | | |
|---|---|---|
| Tuning Unit No. | Frequency Range | Minimum Sensitivity |
| CFI-L | 1,000 — 2,040 mc | —90 dbm |
| CFI-S | 1,900 — 4,340 mc | —90 dbm |
| CFI-M | 4,200 — 7,740 mc | —86 dbm |
| CFI-X | 7,300 — 10,000 mc | —85 dbm |
| CFI-KS | 9,850 — 15,000 mc | —80 dbm |

All Polarad RI/FI systems are furnished with the appropriate calibrated antennas, per MIL-I-26600

## CALIBRATED MICROWAVE FIELD-INTENSITY (RI/FI) METER — 1,000 to 21,000 MC!

*Full Category A Air-Force Approval Per MIL-I-26600 and MIL-I-6181 to 10 KMC!*

**Widest range ever offered in a microwave RI/FI meter!**
Combines internal signal generator, field-intensity meter, and calibrated antenna system. Provides accurate absolute power level and frequency measurements. The signal level indication is in microvolts, db above 1 microvolt, and db above 1 microvolt per megacycle.

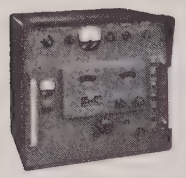
*Model FIM-2*

- Only microwave Field Intensity Receiver with self-contained signal generator which calibrates entire system under test at any level.
- First single microwave test system to determine radiated r-f interference and susceptibility.
- Front-panel meter indicates average, peak, slide-back peak or quasi-peak value of r-f signals. Outputs for video, audio and recorder.
- Six interchangeable tuning heads cover 1,000 to 21,000 mc.
- Direct-indicating peak VTVM for ease of frequency location of impulse noise.
- Single UNIDIAL® tuning control tunes both the receiver and signal generator.
- Calibrated antenna system includes an omni-directional broadband antenna and separate directional antennas to match each tuning unit.
- Frequency Dial Accuracy: ±1%
- Maximum RF Input: 3 volts
- Impulse Bandwidth: 5 mc
- Image and Spurious Response Rejection: Better than 60 db
- Attenuation: 0 to 80 db in steps of 1 db

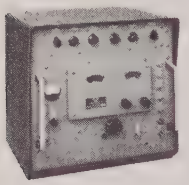
| Six Interchangeable Plug-In Tuning Units†: | | |
|---|---|---|
| Tuning Unit No. | Frequency Range | Minimum Sensitivity |
| FIM-L2 | 1,000 to 2,240 mc | —81 dbm |
| FIM-S2 | 2,140 to 4,340 mc | —81 dbm |
| FIM-M2 | 4,200 to 7,740 mc | —81 dbm |
| FIM-X2 | 7,360 to 10,000 mc | —81 dbm |
| FIM-KS | 9,850 to 15,350 mc | —73 dbm |
| FIM-KU | 14,800 to 21,000 mc | —70 dbm |

†U.S. Patent 2,774,243

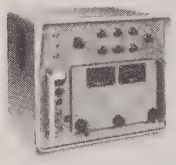
# POLARAD MICROWAVE SIGNAL GENERATORS



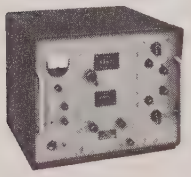
*Model PMR*



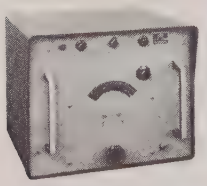
*Model MSG-1R/2R/2PA*



*Model PMX*



*Model MSG-34*



*Model KSS*

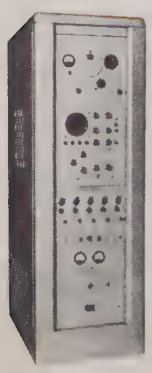
Polarad signal generators and sources incorporate every significant mechanical and electronic advancement known to the art, including a number of Polarad exclusives. These instruments are used by the thousand in every phase of microwave development and measurement. They are widely used in permanent test consoles, because of their exceptional stability and reliability. In particular, experienced engineers appreciate the outstanding features listed here, which generally apply to all units in the line, with some variations.

- **Accurate frequency calibration — ±1%, except EHF ±0.1%**
- **DIRECT-reading UNIDIAL® (EHF has direct-reading wavemeter).**
- **Low thermal and power-line drift.**
- **Exceptional permanence of calibration.**
- **Extremely versatile modulation capabilities.**
- **Accurate, directly-calibrated attenuators.**
- **Generators all have accurate absolute power-level calibration.**

## 500-11,000 MC SERIES

Features include: High-stability, non-contacting klystron-cavity shorts for noiseless tuning, calibration permanence; UNIDIAL®; exceptionally complete modulation capability. The PMR is particularly notable for its precise, wide-range, low distortion FM capability, extremely valuable in microwave telemetry applications.

| MODEL | FREQUENCY KMC | CALIBRATED POWER OUTPUT | INTERNAL MODULATION |
|---|---|---|---|
| PMR | 0.5 - 1.0 | −3 dbm (0.5 MW) to −127 dbm | FM: 100-100,000 cps, 0 to ±300 KC deviation. < 1% harmonic distortion. |
| MSG-1R | 0.95 - 2.40 | 0 dbm (1 MW) to −127 dbm | All instruments in this group: pulse & FM modulation: 10-10,000 pps. *pulse width: 0.2-10 μsec. pulse delay: 2-2,000 μsec. square-wave modulation: 10-10,000 pps. FM deviation: ±2.5 MC min. *0.3-10 μsec. in MSG-1R and MSG-2PA |
| MSG-2R | 2.0 - 4.60 | 0 dbm (1 MW) to −127 dbm | |
| MSG-2PA | 2.4 - 4.0 | +10 dbm (10 MW) to −127 dbm | |
| PMX | 4.45 - 11.0 (2 plug-ins) | 0 dbm (1 MW) to −127 dbm | |
| MSG-34 (Ultra Broadband) | 4.2 - 11.0 digital freq. indicator | 0 dbm (1 MW) to −127 dbm | |
| KSS (Signal Source) | 1.05 - 11.0 (4 plug-ins) | Uncalibrated Power Output: 14-400 MW, depending on freq. | sq-wave, 10-10,000 pps (external pulse, sq-wave FM) |



*Model B*

### MULTI-PULSE CODE-MODULATED MICROWAVE SIGNAL GENERATOR

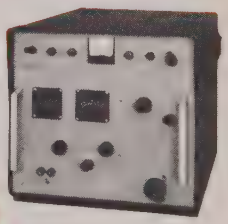
Provides microwave signals (0.95-10.75 KMC) modulated by coded pulse combinations, for testing and simulating IFF, radar, beacons, navigation systems, telemetry, communication links, missile guidance systems. Five independent pulse generators combine to produce complex modulation codes. (See description of MP-1A on opposite page for additional data on modulator.) Built-in precision 'scope.

| Four Interchangeable Oscillators | |
|---|---|
| **Tuning Unit** | **Frequency Range** |
| BL-1 | 950 to 2,400 mc |
| BS-1 | 2,150 to 4,600 mc |
| BC-1 | 4,450 to 8,000 mc |
| BX-1 | 7,850 to 10,750 mc |

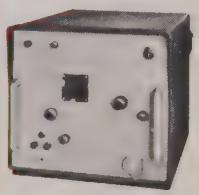
### EXTREMELY HIGH FREQUENCY MICROWAVE SIGNAL GENERATORS & SOURCES

Generators are frequency and power calibrated, Sources are frequency calibrated only. CW, 1KC internal AM, or external modulation. High power output. See chart for plug-in tuning units. Also available: SG1218 (Generator) or SS1218 (Source) 12.4-17.5 KMC.

| EHF SIGNAL GENERATOR Tuning Unit | Frequency Range | EHF SIGNAL SOURCE Tuning Unit |
|---|---|---|
| G1822-1 | 18,000 to 22,000 mc | S1822-1 |
| G2225-1 | 22,000 to 25,000 mc | S2225-1 |
| G2427-1 | 24,700 to 27,500 mc | S2427-1 |
| G2730-1 | 27,270 to 30,000 mc | S2730-1 |
| G3033-1 | 29,700 to 33,520 mc | S2933-1 |
| G3336-1 | 33,520 to 36,250 mc | S3336-1 |
| G3540-1 | 35,100 to 39,700 mc | S3540-1 |
| | 39,600 to 46,000 mc | S4046-1 |
| | 45,900 to 50,000 mc | S4650-1 |



*Model EHF Generator*



*Model EHF Source*

ND SOURCES

POLARAD

# MODULAR MICROWAVE SIGNAL-GENERATOR COMPONENTS

3,800 TO 21,000 MC

*Model 1809/10 Signal Generator*

Latest addition to the Polarad line, this integrated group of seven elements offers the system designer a choice of 86 useful basic combinations for composing a precision signal reference source in the 3,800 to 21,000 megacycle range. These light, compact, self-powered elements can be mounted in your laboratory rack, or stacked in your field location. Any Generator or Source may be used alone, or with the appropriate Doubler; combinations of Generators and/or Sources may share the use of one or both Doublers, and the Modulator may be used as a common driver in all cases. From a single unit to the most elaborate console, all installations offer the same high standards of accuracy, stability, and reliability that characterize the Polarad line of microwave equipment.

## SIGNAL GENERATORS

**Model 1107 Model 1108**

Featuring digital frequency readout with ±0.5% accuracy. VSWR of 2:1 maximum, internal modulation 800—1200 cps square wave, and 800—1200 cps FM sawtooth with continuously adjustable sweepwidth to ±5 MC from center frequency. Accepts external 1 cps to 1 MC pulse, square wave modulation and 100 cps — 500 KC frequency modulation.

Calibrated power output of 2 MW (+3 dbm) down to —127 dbm, with ±2 db absolute accuracy.

## SIGNAL SOURCES

**Model 1207 Model 1208**

Features identical to signal generators above without calibrated output power.

Minimum power output Model 1207—50 MW. Model 1208—25 MW.

## FREQUENCY DOUBLERS

**Model 1509**
Output: 10,000—15,500 MC
Input: 5,000—7,750 MC

**Model 1510**
Output: 15,000—21,000 MC
Input: 7,500—10,500 MC

Less than 18 db conversion loss; 250 MW max. input power, 2:1 max. VSWR. Calibrated power output of 1 MW (0 dbm), with frequency-insensitive attenuator, continuously variable from 0 to —100 dbm, calibrated directly in-dbm, accurate to ±2 db.

## MODULATOR

**Model 1001 Pulse Square Wave and Sawtooth FM**

Designed to drive above generators and sources. 10-10,000 pps, positive 20-volt-peak output pulses, 0.2-10 microseconds wide, internal or external synchronization. 150-ohm output impedance permits driving up to 10 feet of interconnecting cable if necessary. Sync pulse output delivers 15-volt positive pulse, with adjustable delay up to 2000 microseconds.

## Now! ELECTRO-OPTICAL INSTRUMENTATION!

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### INFRA-PAK™

**MODULAR COMPONENTS for the infrared, visible, and ultraviolet bands.**

An integrated system of components for generating, processing, detecting and measuring radiation.

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# POLARAD MICROWAVE INSTRUMENTS & ACCESSORIES

## TRANSISTORIZED MICROWAVE IMPULSE GENERATOR

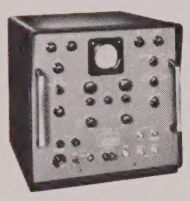
**WIDE-BAND:** 1 MC to 10,000 MC, flat within ±0.5 db. Generates 0.02 nanosecond pulses!

**VERSATILE:** Calibrates microwave receivers for RI/FI work. Ideal signal source for checking spectrum analyzers. Recommended for noise, bandwidth, and jamming measurements.

**CONVENIENT:** Choice of mobile battery or power line operation. Light and compact — truly portable. Output directly calibrated in db above 1 μvolt/MC bandwidth. Two power level ranges. Impulse level adjustable. Regulated power supplies.

*Model IC-120A/B*

## PULSE JITTER TESTER



**VERSATILE:** Measures pulse-width jitter, repetition-rate jitter, and pulse-to-pulse jitter, displays envelope of jitter, permitting complete analysis and identification of disturbance frequency. Separate video and disturbance-freq. outputs.

**WIDE-RANGE:** Ranges from 5 nanoseconds to 100 μseconds full scale on absolute (prf) jitter, and 5-100 nanoseconds full scale on relative jitter. Resolves down to 0.5 nanoseconds accurately! Prf acceptable from 50-6,000 pps. Accepts 0.2-10 μsec width pulses, 5 to 50 volts amplitude, positive or negative.

## CODED MULTI-PULSE GENERATOR

Provides 5 identical, independently-adjustable (width and delay) plug-in pulse generators, each of which may be independently pulse-time-modulated by external signal. External or internal synch. Interval markers, every microsecond. Auxiliary output trigger at "zero time", output square wave coincident with pulse group. Extremely flexible pulse — group generator/modulator. High power output — up to 20 volts into 100Ω!

*Model MP-1A*

## PRECISION NOISE GENERATOR

Stable 1 KC to 500 MC noise source for direct measurement of noise figure of vacuum-tube and transistor amplifiers, receivers. Direct-reading, accurately-calibrated 1-20 db output control (with 0-1 db interpolation control) ±0.25 db accuracy. Accommodates wide range of terminating impedances. Employs long-life, inexpensive noise tubes. Simple, accurate, trouble-free!

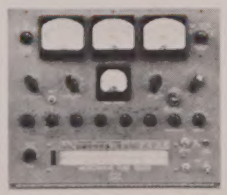
*Model N-1*

## ALL-CERAMIC REFLEX KLYSTRONS

An integrated family of rugged reflex klystrons for CW, FM, or pulse operation in an external cavity. Ceramic construction withstands shock, vibration and thermals, 250°C seal temperature without forced cooling. Request complete application data, curves, design assistance.

## MICROWAVE TUBE TESTER

Checks klystrons, pencil triodes, rocket and lighthouse tubes for static operating levels, shorts, filament continuity, as simply as a conventional tube tester. Provides and monitors wide range of cathode, anode, reflector, and grid voltages and currents; functions as universal klystron power supply. Wide ranges, special mounts, integral blower, allow for future tubes as well as present types.



*Model K-200*

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*"Project Mohammed"*

**Latest of the many innovations pioneered by Polarad is the MOBILE MICROWAVE CALIBRATION PROGRAM, bringing a fully-equipped microwave calibration laboratory to your door, by appointment, to perform NBS-traceable calibrations on your microwave instruments, in a matter of hours! Certificates (suitable for comformance to MIL-Q-9858) will then be issued by the Polarad Calibration Engineer, on the spot. Your Polarad representative has complete details on how we are "bringing the Mountain to Mohammed", including price lists, test standards, and an approximate itinerary for the Mobile Calibration Laboratory. Just ask him to tell you about "Project Mohammed"!**

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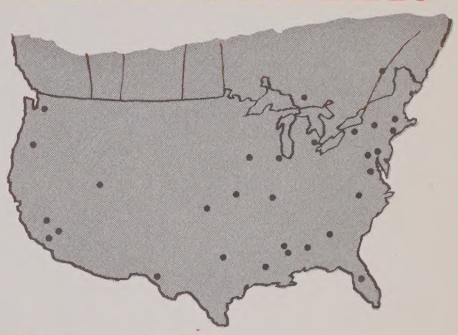

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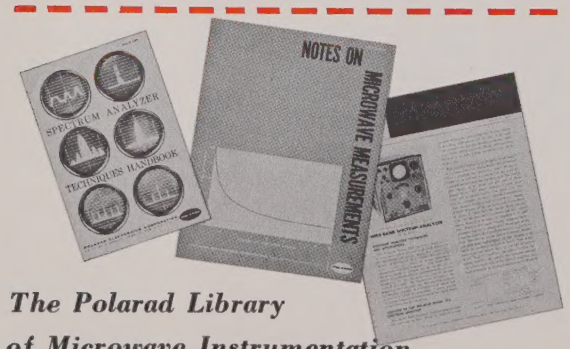


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